AIR ENGINEERING

JUNE, 1960

AIR POLLUTION CONTROL • AIR MOVING • AIR CONDITIONING

- *14 Ways To Remedy Noise and Vibration In Ducts*
- *How Air Is Handled At Idlewild Air Terminals*
- *Getting Your Money's Worth From Fans*
- *Cement Plant Dust Control Pays Its Way*
- *Corrective Measures AFTER System Balancing*

THE UNIVERSITY OF MICHIGAN
JUN - 1960
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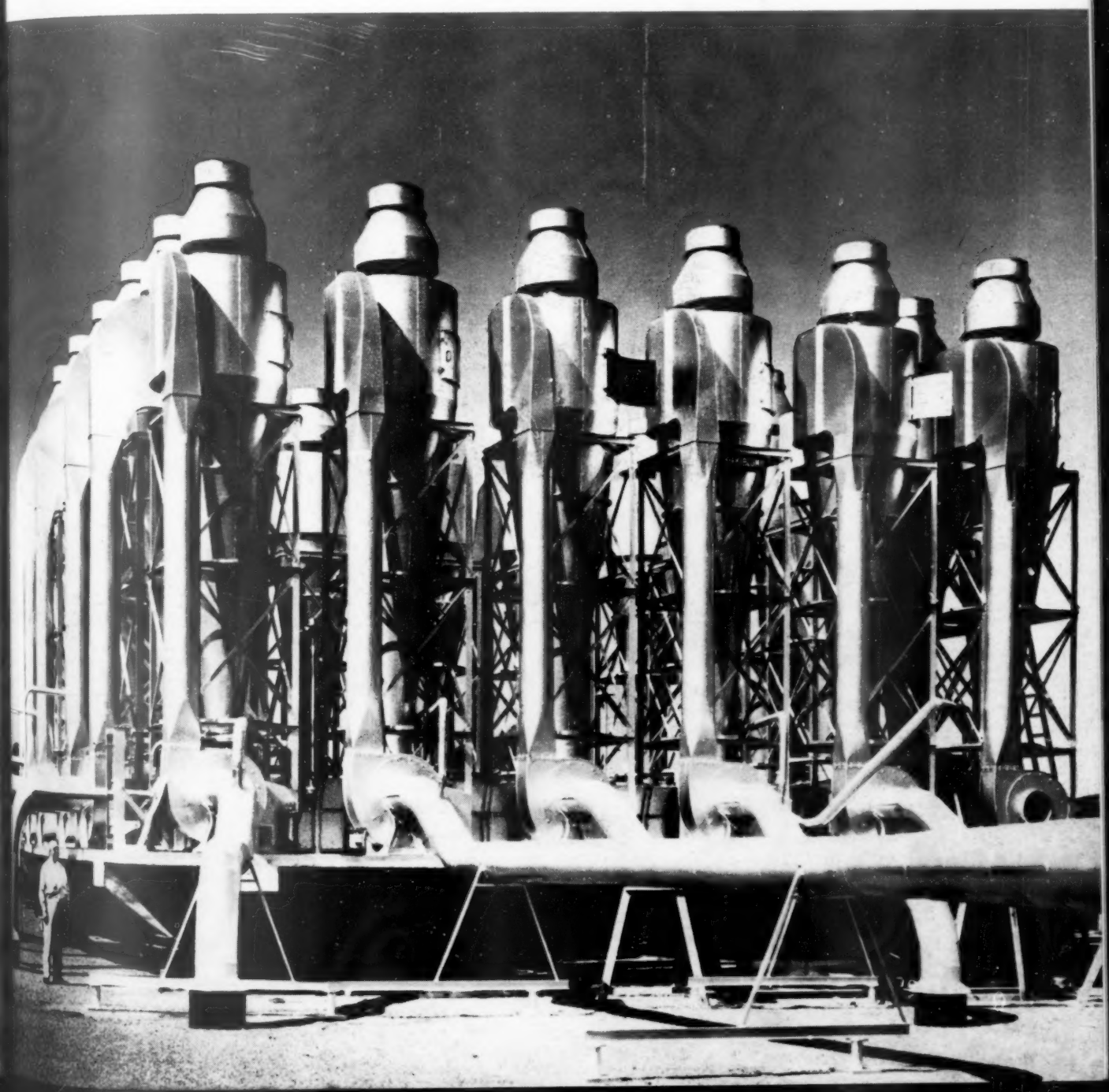
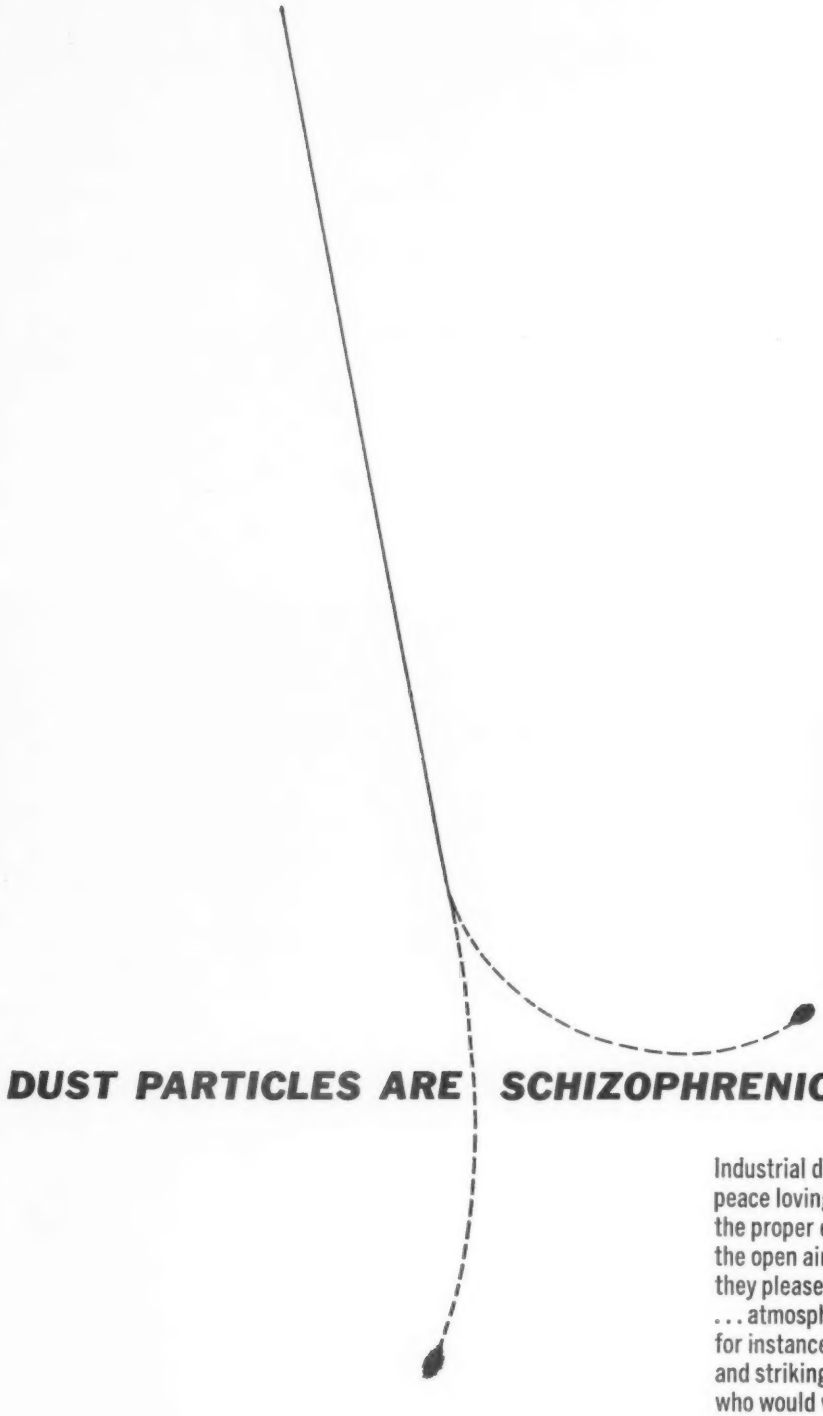
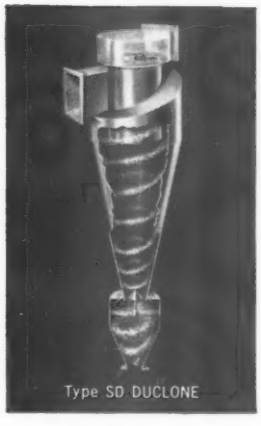




DUST PARTICLES ARE SCHIZOPHRENIC


Type SD DUCLONE

Industrial dusts have split personalities. They can be peace loving, pleasant, and in some cases precious . . . in the proper environment. But let them get out into the open air where they are free to roam and settle where they please! They become unbearable public enemies . . . atmospheric delinquents. Take fine mineral particles, for instance. In their proper setting their brilliance and striking colors would stir the heart of a poet. But who would want them settling from the sky on a white suit or staining a newly painted house? Esthetic beauty in one place can be unwanted ugliness in another.

Let Ducon dust specialists psychoanalyze your industrial dust and prescribe the right treatment to keep it under control. We have a full line of wet and dry dust control devices to solve your problem.

Write for Bulletin C 1058

DUCON — DUST CONTROL SYSTEMS AND EQUIPMENT

the name in DUst CONtrol

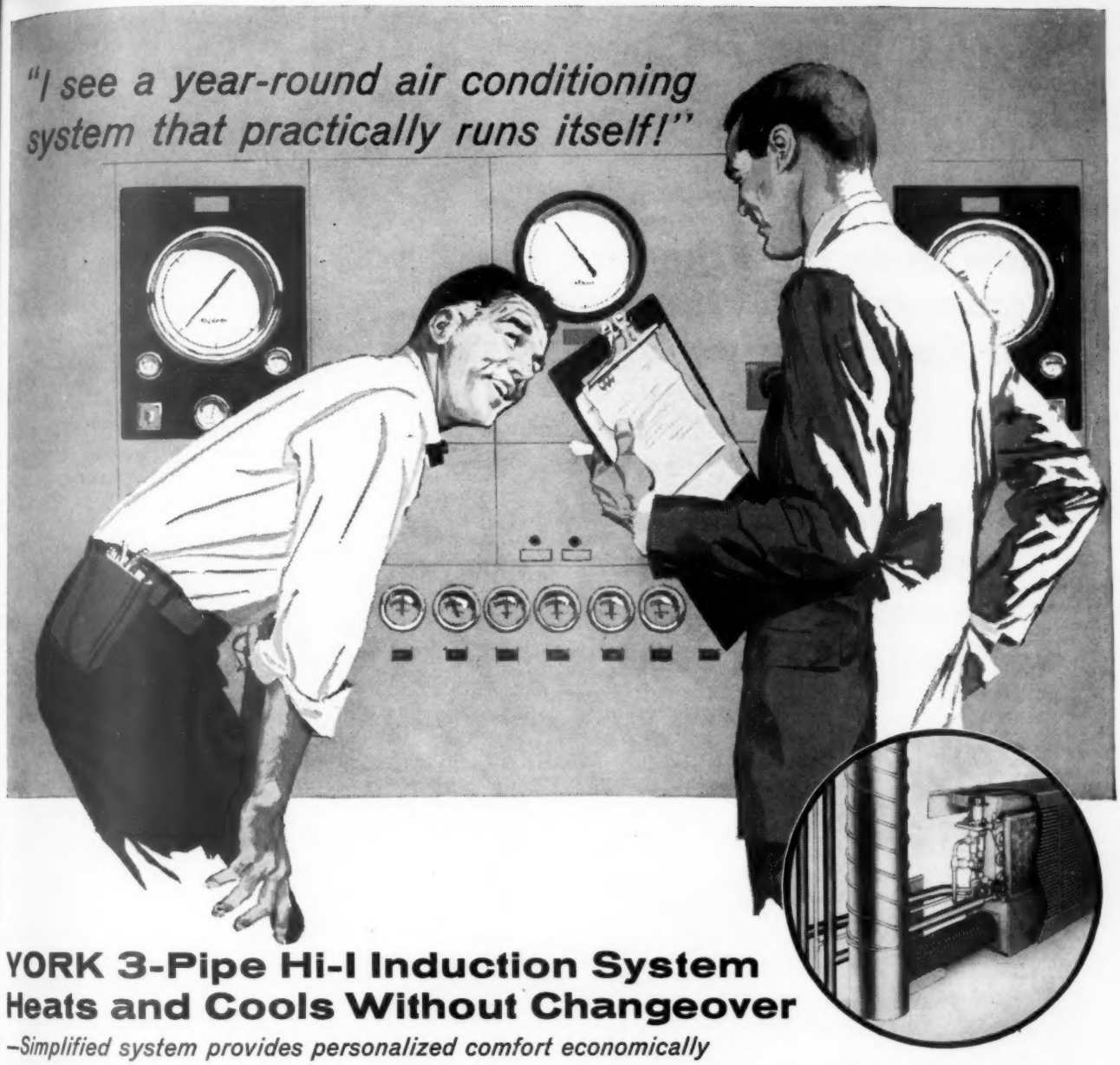
THE **Ducon** COMPANY INC.

147 EAST SECOND STREET • MINEOLA, L. I., NEW YORK

CYCLONES • CENTRIFUGAL WASH COLLECTORS • TUBULAR CLOTH FILTERS • DUST VALVES

Canadian Branch:

THE DUCON COMPANY, of CANADA, Ltd., 1131 Pettit St., BURLINGTON, ONTARIO, CANADA



YORK 3-Pipe Hi-I Induction System Heats and Cools Without Changeover

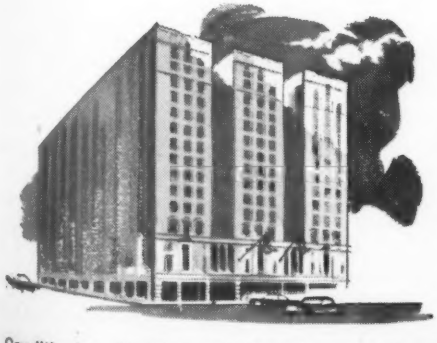
–Simplified system provides personalized comfort economically

HOT AND COLD WATER AT EACH UNIT—York-designed, non-mixing, 3-way control valve selects either hot or cold water and modulates the flow to the coils to provide the desired room temperature at any time of day, all through the year.

HIGHER LEVEL OF COMFORT—Having both hot and cold source at each unit means instant response and allows wider temperature variation from room to room. This provides greatest personalized comfort and satisfies each occupant's exact wishes.

ELIMINATES MANY COSTLY COMPONENTS—Initial cost of York's 3-Pipe System is competitive with regular 2-pipe systems. Eliminating duplicate zoning equipment, costly controls and excess air for heating offsets cost of third pipe, saves space.

LOWER OPERATING COSTS—Each unit functions as a separate zone receiving just the right amount of either warm or cold water to maintain desired space conditions. If neither heating or cooling is needed, there's no flow. *No wasted energy!*



Another YORK Trail Blazer Concept Proved In Action at *Statler-Hilton Hotel, Boston, Mass.*—York 3-Pipe Hi-I Induction System delivers instant personalized comfort to 1,300 guest rooms. Compact, modern induction units replaced radiators, provide heating *and* cooling in same place.

YORK

YORK CORP., SUBSIDIARY OF BORG-WARNER CORP., 6106 GRANTLEY RD., YORK, PENNSYLVANIA
In Canada—Canadian Ice Machine Co., Ltd.

YORK B-W DIVISION

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RESEARCH & ENGINEERING
MAKE IT BETTER

Air Conditioning, Heating, Refrigeration and Ice-Making Equipment • Products for Home, Commercial and Industrial Applications

Just How Clean is clean Air

How clean must the air be in Commercial and Industrial Air Conditioning Systems

How can the specific clean air requirements be achieved in–

Hospital Operating Rooms
Computer Ventilating Systems
Process Exhaust Systems
"Dust-Free" Rooms

. . . and what is the POSITIVE, low-maintenance way to get it

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REPRESENTATIVES IN PRINCIPAL CITIES

Letters

Is This Approach To Bidding Ignored?

Editor:

I have read with interest the comments on Mr. Horsch's article ("Specifications: Closed, Open, or Base Bid?", December, 1959) in the February AIR ENGINEERING, and if I may be permitted to add my two cents to this discussion, wish to suggest an approach that seems to be ignored.

In the power plant field, economy of operation and ease of maintenance are considered along with first cost. To achieve this evaluation, the consulting engineers quite often take bids themselves on operating equipment. They require a great deal of information that never comes to light in the public building field in order to evaluate this equipment.

To me, this type of bidding nullifies most of the arguments put forth about base, open, and closed specifications.

1—The contractor does not have to shop his bids in order to get a low price which sometimes results in poorer quality material.

2—Poor quality material or incorrect material is weeded out before the contractors have to bid.

3—The owner gets the direct benefit of not only a low first cost, but the lowest operating and maintenance cost.

4—Changes in the layout that may be necessary to accommodate equipment can be made before the contractors bid and allow the contractors to bid more accurately.

Why not put specifications out on public building jobs to the equipment manufacturers before the contractors bid? The consulting engineer could evaluate and pick the equipment to be used and specify when the contractors bid that contractor should allow X number of dollars for the purchase of equipment to be used on the job.

Any peculiarities of the equipment to be used would be known ahead of time and would allow the contractors to figure a more accurate price. The contractor would still be able to take his mark up on the equipment and would be saved the time of sorting out manufacturers' bids to make sure they

(Please turn to page 8)

AIR ENGINEERING

VOL. 2, NO. 6

JUNE, 1960

DEDICATED TO THE SCIENCE OF AIR POLLUTION CONTROL
AIR MOVING • AIR CONDITIONING

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14 procedures to eliminate these problems

How Air Is Handled At Idlewild . . . Part II 27
What was done in each terminal building

Are You Getting Your Money's Worth Of Air From Your Fans? 30
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How To Balance Big Building Air Conditioning Systems . . . Part III 37
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COVER

View of dust collection and associated fan and blower equipment at Formica Corp., Cincinnati. Notice excellent layout of ducting to and from blowers illustrating good design discussed in articles on pages 23 and 30. Photo courtesy Westinghouse Electric Corp. and Kirk & Blum Mfg. Co.

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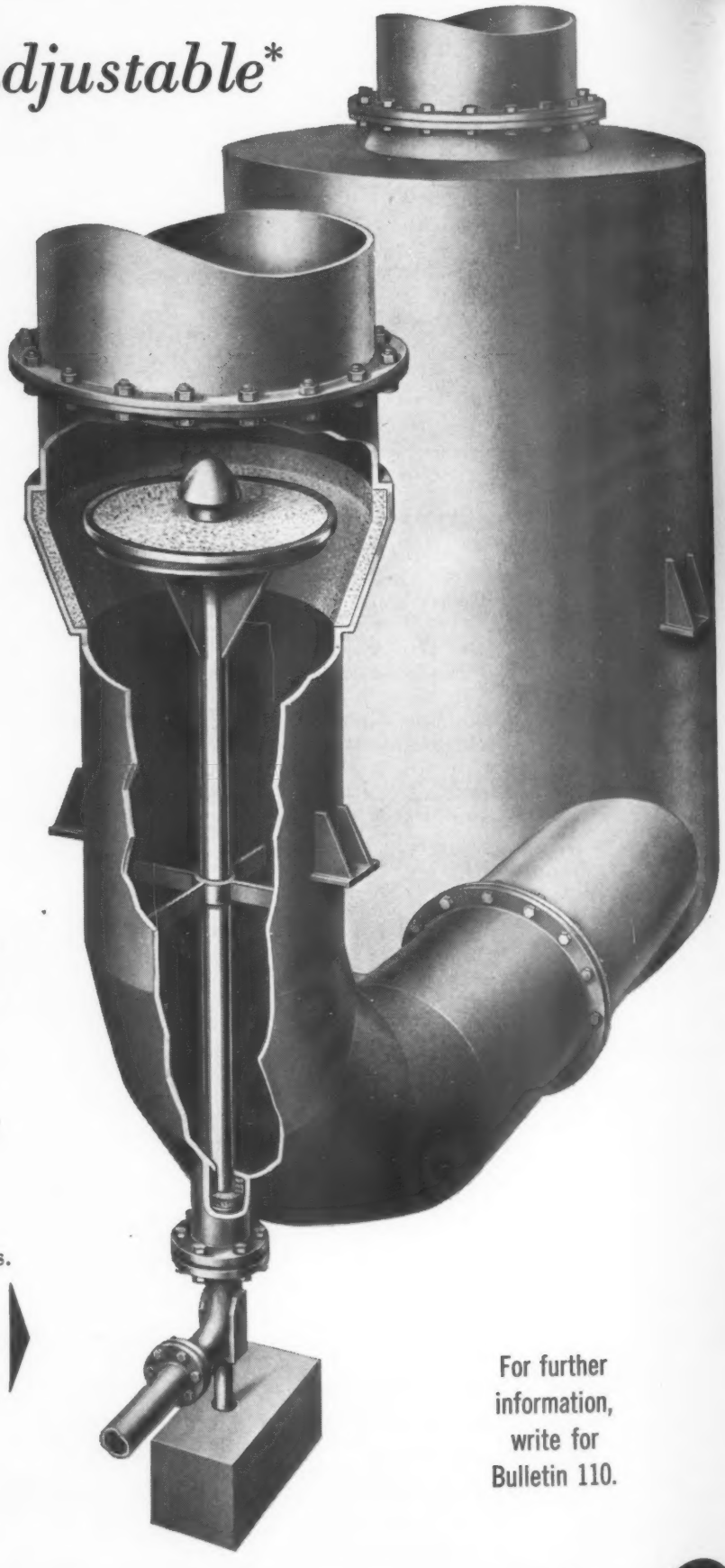
*Completely adjustable**

Flooded Disc Scrubber

Removes Sub-Micron Fumes



The Research-Cottrell high efficiency scrubber uses the unique flooded disc principle for removing sub-micron fumes in steel-making furnaces and chemical processing.

As shown in the illustration, the outstanding feature of this scrubber is the simple, adjustable "flooded disc." The flooded disc adjusts for maximum cleaning efficiency over a wide range of operating conditions.

* *Automatic positioner immediately adjusts the disc to meet your varying gas and dust control problems.*

Research-Cottrell, with over 48 years of industrial gas cleaning experience, will be glad to consult with you on any specific problem.

For further information, write for Bulletin 110.

Research-Cottrell

RESEARCH-COTTRELL, INC., Main Office and Plant: Bound Brook, N. J.
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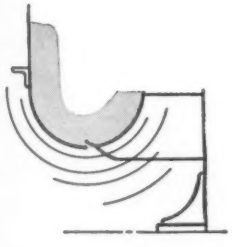
RESEARCH COTTRELL INC. TRADE MARK RC107

THESE ADVANTAGES MAKE "BLH" YOUR BEST BUY FOR

HEAVY-DUTY AIR HANDLING

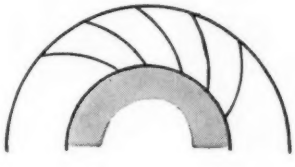
- **High efficiency over a broad range of operation** — ideal for supplying ventilation and air conditioning systems.
- **Stable performance** over the entire range of operation — dependable delivery.
- **Handles pressures up to and including Class IV applications.**
- **Capacities up to 500,000 cfm** and over — in closely graduated sizes to permit exact selection for the job.

"Q" Factor* Features Available Only in Buffalo Designs



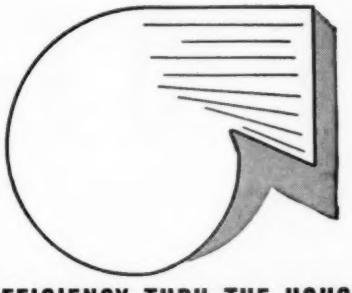
EFFICIENCY AT INLET

Cross-section of inlet, showing smooth half-circle passage into wheel formed by curved inlet bell and mating wheel flange. There are no flat spots to cause turbulence.



EFFICIENCY IN THE WHEEL

Showing deep, backward curve of blades in "BLH" wheel for smooth, quiet handling of air spun into the wheel in the direction of rotation. No waste turbulence.



EFFICIENCY THRU THE HOUSING

Not only is the "BLH" housing streamlined throughout, but its unique fared outlet delivers air to discharge duct with easy, gradual enlargement for best distribution and static conversion.

Write for new Bulletin F-201 for full details.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY

Buffalo, New York

Buffalo Pumps Division • Buffalo, N. Y.

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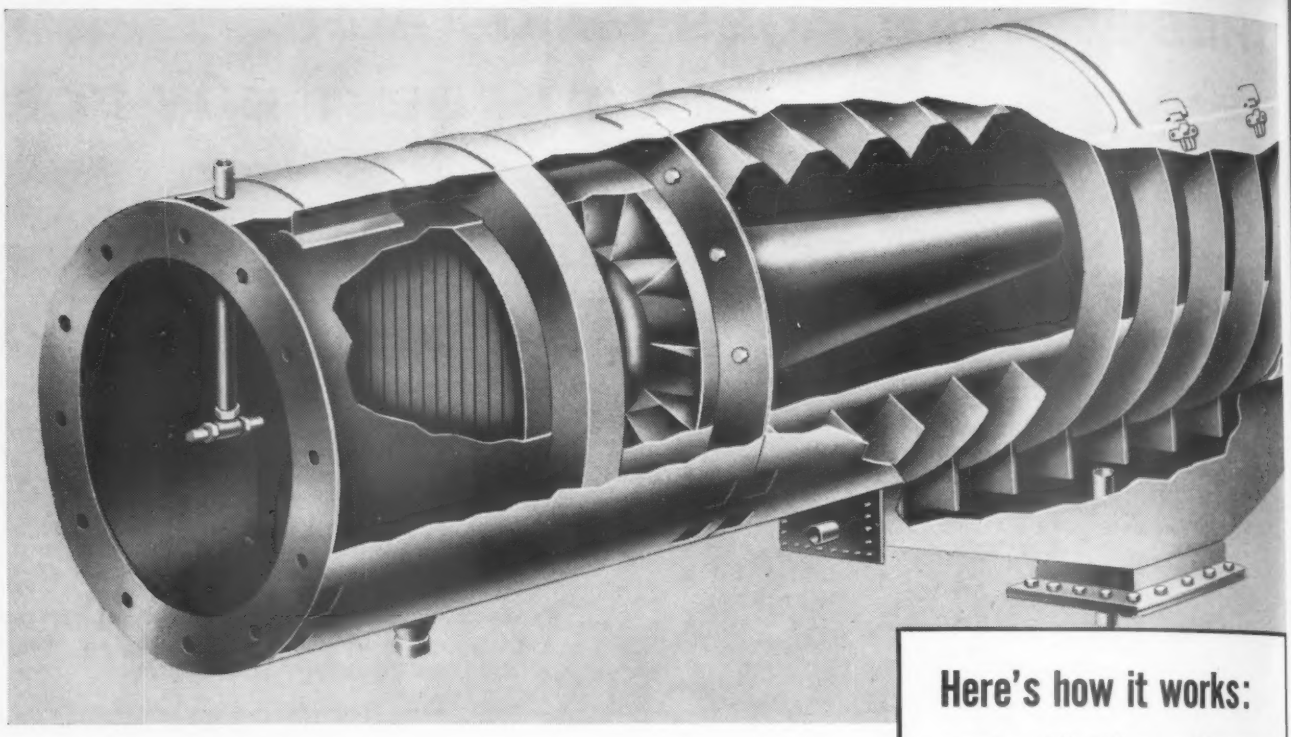
VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING
FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING



The Western Precipitation

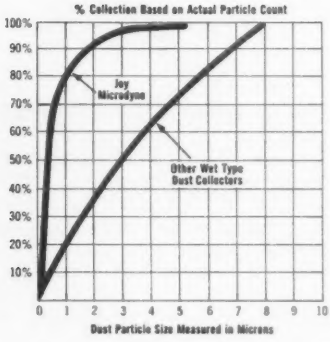
JOY MICRODYNE®

SCRUBBER PACKS HIGH EFFICIENCY IN 1/10 THE SPACE

Here's how it works:

a spray of liquid enters the collector along with the dust. An impingement screen helps to encase each particle with liquid. Then fixed vanes impart a whirling motion to the wet, dust laden air. Moisture and dust particles are thrown to the sides by centrifugal force and drain into a sump.

The liquid used may be water, oil or solvents, depending on the material being collected.



By combining two proved principles of dust collection, the Joy Microdyne collects over 99% by weight of dust particles 5 microns and larger; 92% of 2-micron dust. This means cleaner air.

Because of its unique design the Joy Microdyne is extremely compact . . . 1/10 to 1/20 the size of conventional wet collectors. For example: an 8000 cfm unit is only 26″ in diameter, 130″ long. This means lower initial cost and easier installation . . . in fact, the Joy Microdyne can be installed as part of existing ductwork.

The Joy Microdyne Scrubber is another in the wide range of dust collection equipment offered by Western Precipitation—by far the most complete line in the industry. *Write for descriptive literature!*

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Cottrell Precipitators	Multiclone Dust Collectors	Therm-O-Flex Hi-Temp Filters	Dualaire Reverse-Jet Filters	Turbulaire-Doyle Scrubbers	Joy Microdyne Scrubbers	Combination Units	Holo-Flite Processors	Hi-Turbiant Heaters

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EDITORIAL:

Revolution In Education -- Via Air Engineering

AIR ENGINEERING triggered, in its January issue, a movement which may impact excitingly on the entire American scene of higher education.

Under the title, *"Khrushchev, Here We Come — With Air Conditioned Schoolrooms,"* this publication was first to advocate accelerated and expanded educational programs *via* conducive-to-study temperatures, humidities, and clean air.

This idea now is ballooning. For example:

Carrier Corp. soon will gather educators from all around the nation to discuss possibilities of this concept.

And Dr. Grayson Kirk, President of Columbia University, recently proposed in a national magazine that we revamp our system so as to grant a college degree in three years, instead of four, by adding a third (summer) semester to each school annum.

Under the prevailing two-semester system our universities are stuck with idle "plant capacity" approximately four months per year. Why burden ourselves with tremendous additional taxes to build classrooms and laboratories and dormitories which also will lie idle four months out of each year?

Our present two-semester program originated more than 100 years ago, when students were needed back on the farm to harvest crops. Thus it is an anachronism. Less than 5 percent of our college applicants today ever will work on a farm.

To be sure, students complain that classrooms and living quarters are too hot during a summer term. But, the air conditioning of existing school buildings and dorms would cost a tiny fraction of the expenditure necessary for erecting new structures to accommodate the "collegiate population explosion" which is imminent.

Moreover, we could pay the professors better under a trisemester system. A three-semester year would mean 33 percent more turnover, 33 percent more student fees. At least 20 percent of this extra income could be funnelled to the teachers. Other considerations:

College graduates face one-to-three years of military service after earning their degrees. These "lost years" would be foreshortened by a three-year collegiate program.

(Please turn to following page)

Editorial (Cont.)

Revolution In Education

(Continued from preceding page)

Prospects for post-graduate degrees (medicine, law, engineering, teaching, etc.) wouldn't be discouraged from qualifying for those professions, because the present seven or eight years of advanced schooling could be condensed into five or six.

Also, possibly, this three-year, three-semester program eventually would be embraced by high schools, many of which already are laboring under two shifts per day, overcrowded classrooms, etc.

AIR ENGINEERING is the Key to workability of this idea. Obviously subscribers to this publication will gain by promoting it. But their endeavors in its behalf won't be primarily selfish.

Remember: you will be selling Better Education for More Young People. Air engineering simply make a "third term" possible, feasible, and palatable.

Air engineering, in its whole sense of properly healthful indoor climate, will produce better scholars *all year 'round,* even if the "third term" idea is not adopted on a huge scale.

All our schoolchildren will do better work under controlled atmospheric conditions in which they have "breathing room." ▲▲

Letters

(Continued from page 2)

contain all the material for the job.

I will admit that this method would add more work to the consulting engineer's job, but he would know exactly what he is getting and would be able to control the job more closely.

I would be quite interested to find out what other manufacturers, consulting engineers, contractors, and owners think of this idea.

D.D.L.
Rochester, N. Y.

Protests Smog Editorial

Editor:

With regard to your March editorial "Smog Causes Cancer!" it is not made clear whether the findings of Dr. Hueber involve the typical photochemical smog of the Los Angeles area or the smoke-laden atmosphere typical of many cities including the "smoggy, industrial England" to which your editorial makes reference.

This is a very pertinent question in view of the fact that all of the editorial except one sentence seems to make reference to emissions from smoke stacks. Then the editorial makes the amazing leap to the conclusion that "factory managers *and automobile designers,* it will be argued, won't do a darned thing about it unless compelled."

The fact is that there is a great deal of difference between oxidant-type smog in the Los Angeles area and the reducing-type smog in many industrial cities, including those of England.

It is not necessary, I am certain, to spell out the differences chemically between the constituents in the air above these two communities, or the difference between oxidizing and reducing reactions. Some material having a bearing on this point is supplied.

Another fact is that the automobile designers are doing a great deal about the problem, your assumption to the contrary, notwithstanding.

W. F. Sherman, Manager
Engineering & Technical Dept.
Automobile Manufacturers Association, Inc.
320 New Center Building
Detroit 2, Michigan

Wants Data On Cyclones

Editor:

I would like to have some information concerning cyclones, which will be used for milk powder collecting purposes. Sizing of cyclones will be according to the size of powder particle and density.

To get the best efficiency, what would be the introducing velocity to the cyclones? I would also like information on pressure drop across the cyclone, and data on the different types of cyclones. What is the best conveying practice, using pounds or cubic feet of air at 70F per pound of powder?

If you can send me the names of any literature, articles, etc., I certainly would appreciate it very much.

M. C. Akisoglu
Engineer
C. E. Rogers Company
8731 Witt Street
Detroit 9, Michigan

Editor's Note:

AIR ENGINEERING referred Mr. Akisoglu to a number of cyclone manufacturers for answers to his questions. Readers who may be able to help him are urged to contact Mr. Akisoglu through AIR ENGINEERING.

Sulfur Removal Queries

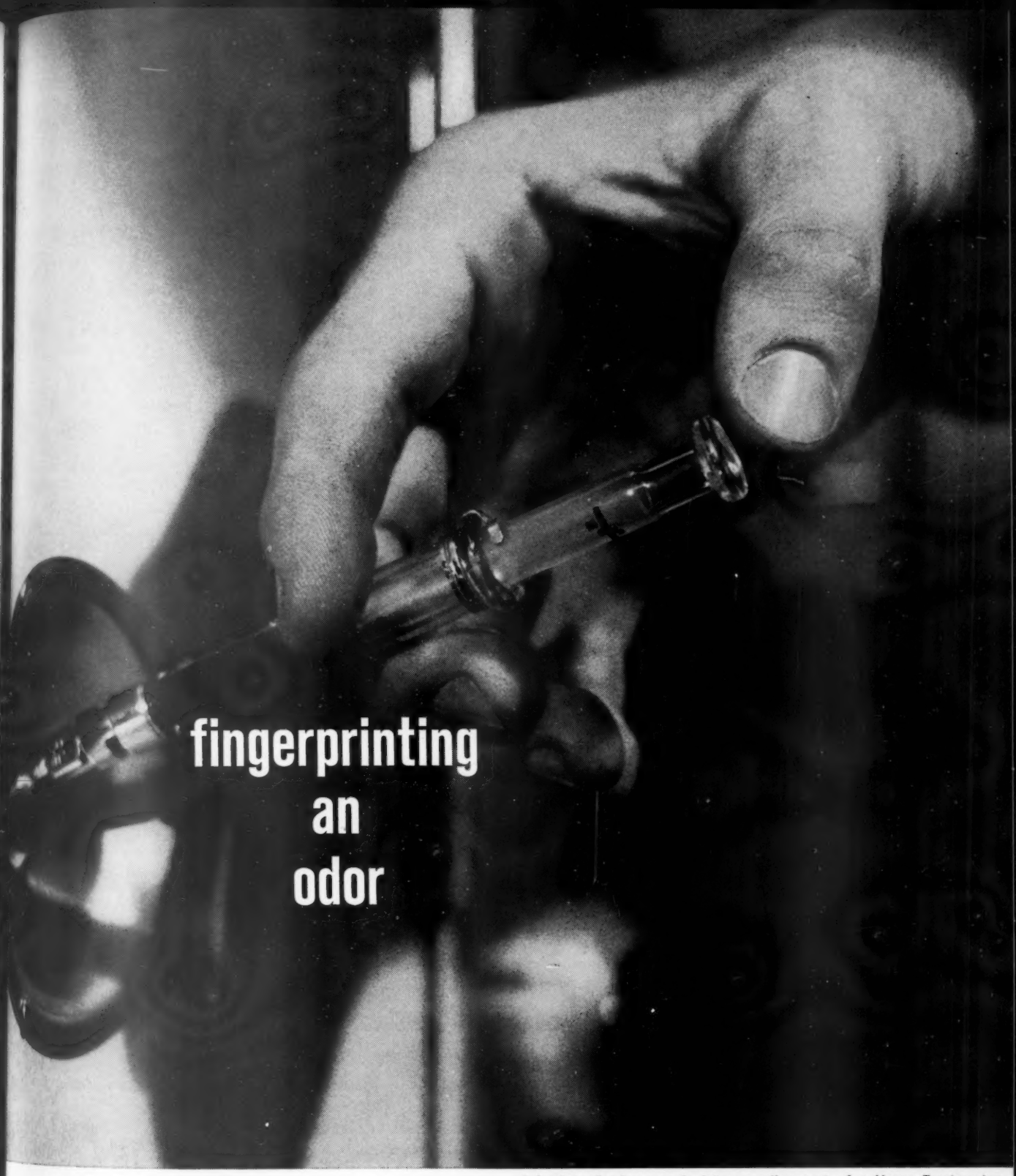
Editor's Note:

We have had quite a few requests for more information on the news item on page 10 of the December, 1959 issue on a new British process for removing sulfur from the stacks of power plants and sulfuric acid plants.

Process is said to recover sulfur salts, and to involve use of ammonia gases that react to sulfur oxides to produce a fog of ammonia-sulfur compounds. Solid sulfur salts are then removed as a powder from gas stream by precipitators.

Those interested in obtaining further information can do so by writing to:

Chemical Construction, Ltd.
9, Henrietta Place
London, W.1
Great Britain



Injection of odor sample into sampling port of a Vapor Fractometer.

... for identification and control

This serious work has been the concern of the Airkem research facility for 20 years. So effective have been their methods for identification and development of counteractants that Airkem has been recognized throughout the world as the leader in odor research. From this research, Airkem chemists and engineers have developed effective and economical methods of odor counteraction for hundreds of industries and governmental facilities.

Odor control has provided society with an important advance in the creation of a healthier environment. When odors and their control become a factor in your organization you will find it advantageous to consult the Airkem Specialists.

Write for a detailed bulletin on odors, their technology and control. Airkem. Inc., Industrial Division, Dept. AE-660, 241 East 44th St., New York 17, N. Y.

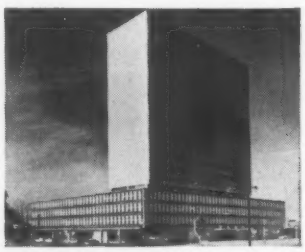
airkem

FOR A HEALTHIER ENVIRONMENT THROUGH MODERN CHEMISTRY

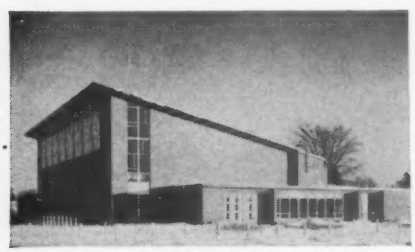
you can design for 100% air recirculation

It's being done every day, with Barnebey-Cheney activated charcoal to purify recirculated inside air. And the savings in heating and cooling costs, as well as reduced initial investment, are substantial. You may, of course, bring in outside air for pressurization or design for less than 100% recirculation for specific reasons. Write today for Bulletin T-323. Barnebey-Cheney, Columbus 19, Ohio.

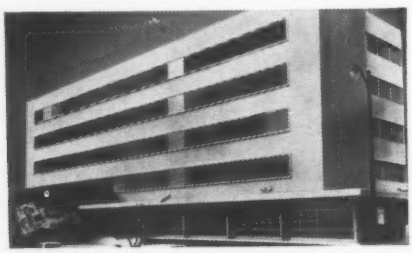
Business increased when this savings and loan company freshened the air in its formerly musty deposit box vaults.



High velocity system handles 87,000 cfm; 74,000 cfm is recirculated, 40% through B-C filters, at Houston Medical Towers.

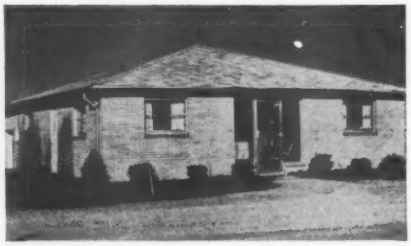


$12,000 was saved in heating installation for this church and school; heating costs cut $1,650 per year, with B-C filters.



B-C permitted reducing outside air intake to 5% in this California Teachers Association building, Los Angeles.

Over 200 B-C filters handle 218,000 cfm in conjunction with electrostatic filters at this Dallas auditorium.



The characteristic aroma of a veterinary hospital is missing from this one, thanks to B-C activated charcoal.

activated charcoal air purification

Barnebey Cheney

Meetings, Courses, Expositions

Edison Electric Institute 28th annual convention, *Warren Theater, Atlantic City, June 6-8.*

Institute of Boiler and Radiator Manufacturers annual meeting, *Seaview Country Club, Absecon, N. J., June 7-9.*

American Society of Heating, Refrigerating & Air-Conditioning Engineers annual meeting, *Royal York hotel, Vancouver, B.C., Can., June 13-15.*

Engineering seminar on electrical precipitation in fly-ash and cement dust collection, *Pennsylvania State University, University Park, Pa., June 12-17.*

National Association of Building Owners and Managers convention, *Philadelphia, June 19-23.*

Chicago International Trade Fair, *Navy Pier, Chicago, June 20-July 5.*

American Society for Testing Materials annual meeting, *Chalfonte-Haddon Hall hotel, Atlantic City, N. J., June 26-July 1.*

Engineering seminar on architectural and engineering planning aspects of atomic shelters, *Pennsylvania State University, University Park, Pa., July 10-22.*

Engineering seminar on structural engineering and radiation shielding aspects of atomic shelters, *Pennsylvania State University, University Park, Pa., July 24-Aug. 5.*

13th International Congress on Occupational Health. *Waldorf-Astoria hotel, New York City, July 25-29.*

Gordon Research Conference on Toxicology and Safety Evaluations, *Kimball Union Academy, Meriden, N. H., Aug. 15-19.*

Special summer program on Noise Reduction, *Massachusetts Institute of Technology, Aug. 22-Sept. 2.*

Western Electronic Show and convention, *Memorial Sports Arena, Los Angeles, Aug. 23-26.*

American Chemical Society fall meeting, *Chicago, Sept. 3-8.*

Production Engineering Show, *Navy Pier, Chicago, Sept. 6-16.*

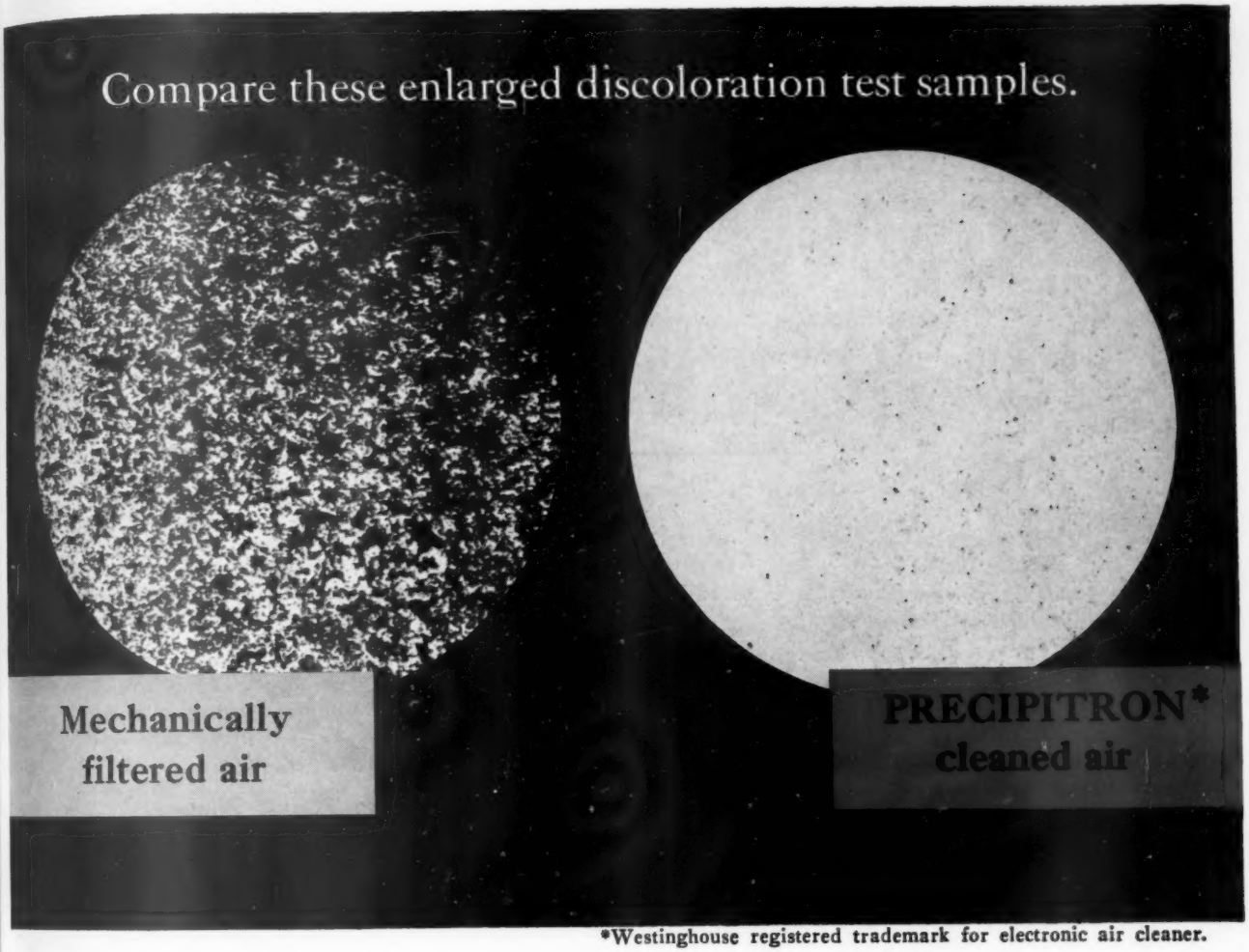
East Central Section, Air Pollution Control Association, *Sheraton-Cadillac Hotel, Detroit, Sept. 22-23.*

Instrument Society of America 15th annual meeting, *New York Coliseum, New York City, Sept. 26-30.*

National Metal Exposition, *Philadelphia Trade and Convention Center, Philadelphia, Oct. 17-21.*

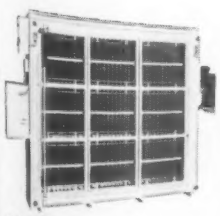
Industrial Hygiene Foundation of America, Inc. 25th annual meeting, *Mellon Institute, Pittsburgh, Oct. 26-27.*

CLEAN AIR ELECTRONICALLY TO MAKE YOUR FILTERING INVESTMENT PAY OFF



*Westinghouse registered trademark for electronic air cleaner.

Westinghouse PRECIPITRON traps air-borne dirt that filters cannot catch



Why do electronic air cleaners outperform conventional filters? By electrostatic ionization and trapping of dirt particles, the Precipitron air cleaner can remove up to 95% of atmospheric dirt. Mechanical filters rarely catch more than 15%. These figures have been confirmed by the National Bureau of Standards Dust Spot Test Method.

Whether you must clean air for an industrial process, maintain merchandise quality, or minimize maintenance cleaning costs, Precipitron air cleaning installed in place of filters, will evaluate to your advantage in lower total cost.

For factual cost comparison data call your Sturtevant Division Sales Engineer for Bulletin B-5201, or write Westinghouse Electric Corporation, Dept. FA99, Hyde Park, Boston 36, Mass. *Sturtevant... pioneers and pacesetters in air treatment for 100 years... 1860-1960.*

YOU CAN BE SURE ...IF IT'S Westinghouse

J-80699

White Rooms In The News

A "brain-storming" conference on White Rooms, held in Philadelphia early this year, attracted some 300 inquiries from air engineers throughout the country for more information on White Room design criteria, according to James Mildon, plant engineer, Lear Inc., Grand Rapids, Mich.

Mr. Mildon spearheaded the meeting, which discussed such topics as facilities design, personnel contamination prevention, air showers, shoe cleaners, special dust-repelling paints, and other related topics.

Another conference on White Rooms, or super-clean rooms for precision assembly where dust-free conditions are required, will be held later this year, date yet to be announced.

World's Largest Thermoelectric Generator Built For Navy

Westinghouse Electric Corp. has announced development for BuShips, U.S. Navy, of a five KW thermoelectric generator, the most powerful ever built. The generator delivers its five KW by direct conversion of heat to electricity without moving parts.

Unit can range from 10 volts at 500 amps to 120 volts at about 42 amps, using kerosene as the fuel.

Cancer From Polyethylene, Polyurethane, Polysilicone Production Processes?

W. C. Hueper, M.C., chief, environmental cancer section, National Cancer Institute, described experiments with polyethylene, polyurethane and polysilicone at a recent American Industrial Hygiene Association meeting. These materials were implanted into animals, he said.

Results, stated Dr. Hueper, showed that highest yield of cancers caused by implants were produced by the polyurethane plastics where the foam contained innumerable small perforations. Polyurethane powder was as potent a cancer causer as polyurethane discs. And vulcanized polysilicone rubber caused more cancers than the nonprocessed polysilicone gum or latex.

Surgeon General Leroy E. Burney recently told a House Subcommittee that a new speedy method to measure cancer-producing agents in city air now requires but five minutes, in comparison with days using the old methods.

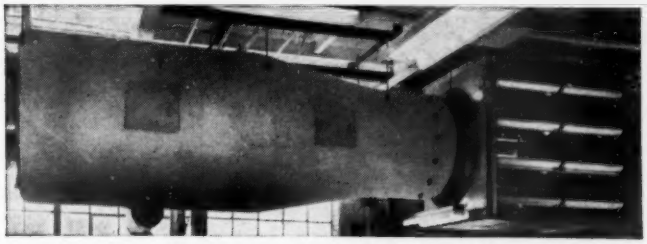
Large Packaged Air Conditioning Systems Held Clue To Profitable Factory Cooling

Cautioning against over-optimistic use of claims of greatly increased production after air conditioning is installed in factories, Carl W. Millsom, vice president, Perfection Div., Hupp Corp., pointed to packaged systems as one answer to normal amortization of industrial air conditioning installations.

In a talk before the Interstate Power Club meeting in N.Y., Mr. Millsom said that as a guide, factory owners should not spend more than one-fourth of the total gross annual wages of the workers in the area on factory air conditioning, unless special conditions, such as high internal heat gains or few workers, are present.

Use of packaged air conditioning units, now available up to 75 tons, is one of the keys that will unlock lower cost air conditioning in factories. They can be amortized as a production capital investment on the basis of increased productivity from men and machines, he stated.

17 reasons why the Carrier Rotaspray Weathermaker System is



Carrier Rotaspray units may be installed rooftop mounted, ceiling suspended or outside wall mounted.

TODAY'S BIGGEST INDUSTRIAL AIR CONDITIONING NEWS!

1. **Proved in use.** Now in its fifth year of use in many different applications, the revolutionary Rotaspray® Weathermaker System* has proved itself vastly superior to conventional close-control systems.

2. **Unitary design.** Instead of one large conventional central station system serving several departments, each department has its own Rotaspray unit and can change its temperature and humidity to meet its individual needs.

3. **Smaller apparatus size.** A Rotaspray unit requires less than ⅓ the space of a conventional system of equal capacity, due to its high velocity design.

4. **Reduces cleaning and maintenance costs.** Rotaspray units, with exclusive self-cleaning design, require very little maintenance.

5. **Needs no apparatus rooms.** No rooms are required to house Rotaspray units, even when located outside a plant.

6. **Lasts indefinitely.** Rotaspray units, constructed of stainless steel, deliver a long life of trouble-free service—eliminate the need of cleaning and painting.

7. **Eliminates many system components.** Because of revolutionary system design, Rotaspray units need no water strainer, no water pump, no water tanks, no city water and drain piping, no apparatus room and no floor drains.

8. **Needs no air filters.** Instead of trying to keep dust and coarse particles out as conventional systems do, the Carrier system draws them in, separates them from the air and returns them to central point for automatic collection and disposal.

9. **Better humidity and temperature control.** By a new control method, the Rotaspray System eliminates dewpoint control and its problems. Within system capacity, departments simply "dial" the temperature and humidity required.

10. **Low operating weight.** Since Rotaspray units are smaller, require no enclosure, and have no standing water level, their weight is relatively low and units may be ceiling suspended or rooftop mounted without additional building reinforcement.

11. **Constant air supply.** Conventional systems use automatic dampers which close down and reduce the amount of air delivered to the room. Though this causes variations in temperature and humidity, it is a "must" in such systems to prevent excessive operating costs. With the Rotaspray System, air is always constant, yet operating economy is superior.

12. **Longer fan life.** In conventional systems, the fan is on the unit's leaving side where high humidities cause excessive corrosion. The Rotaspray unit, with the fan on the entering side where humidities are lower, greatly lengthens fan life.

13. **Relocates easily to meet plant changes.** Rotaspray units require no housing, are small enough and light enough to allow easy relocation.

14. **Allows lower air quantities.** Rotaspray Systems require from 5 to 10% less supply air than conventional systems. Result: better air distribution and smaller ductwork.

15. **Eliminates "compromise" temperatures and humidities.** With the new Rotaspray System, exact conditions can be maintained in each department. One area is not dependent upon another.

16. **Install evaporative cooling now—simply add refrigeration later.** When a conventional system is converted from evaporative cooling to dehumidifying service, many extensive modifications are required—such as the addition of chilled water lines, water storage tanks, etc. With a Rotaspray System, none of these must be added. Except for minor changes in the control system, the only need is the addition of a water-chilling machine.

17. **Provides more at a competitive price.** Though individual plant conditions vary, on the average you pay no more for a Rotaspray System than for conventional "high-quality" systems. And you get a lot more back in efficiency, economy of operation and maintenance savings. For information about the revolutionary Carrier Rotaspray Weathermaker System, write Machinery and Systems Division, Carrier Corporation, Syracuse 1, N. Y.

**Pat. Pending*

MORE PROOF OF

BETTER AIR CONDITIONING FOR EVERYBODY EVERYWHERE

Carrier

NEWS of the Industry

Keep Up With Air Conditioning, Mechanical Contractors Advised

Mechanical contractors who are interested in big building air conditioning jobs must keep alert to new developments and methods or face the possibility of loss of a part of their business.

That was the message given them by two speakers at the Air Conditioning Panel held at the Mechanical Contractors Association of America recent annual convention.

An analysis of cost and feasibility factors of 17 different kinds of air conditioning systems that might be used in a major apartment house project, as presented by Robert Werden, engineering consultant, revealed that through-the-wall room air conditioners, electric baseboard heating, and various types of heat pump systems are receiving close attention from buyers of big building air conditioning.

The inference to the contractors was that they must understand the techniques of using this new type of equipment, and also understand how they compare with traditional piped systems in first, owning, and operating costs.

They also heard Robert Wood, Ebasco Services, Inc., which speaks for a number of electric utility companies, declare that those power companies who must balance out their peak loads caused by the summer air conditioning demand, must see some rapid progress in the use of heat pumps, or they will switch their promotion efforts to some other area of load building.

A statistical survey conducted among MCA members revealed that the biggest share (just under 50 percent) of the total volume of the average contractor's business was in air conditioning. It was considerably greater than the amount done in plumbing.

The survey also showed that the average net profit of the mechanical contractor continues to shrink. The figure for corporations declined to 2.29 percent of gross business before taxes on the average in 1959 from 2.56 percent in 1958. The figure for individuals and partnerships was 4.99 percent in 1959 compared with 5.42 percent in 1958.

A stepped-up promotion program for hydronics cooling and heating systems, through the Better Heating-Cooling Council, will emphasize the "positive" features of such systems, MCA members were told.

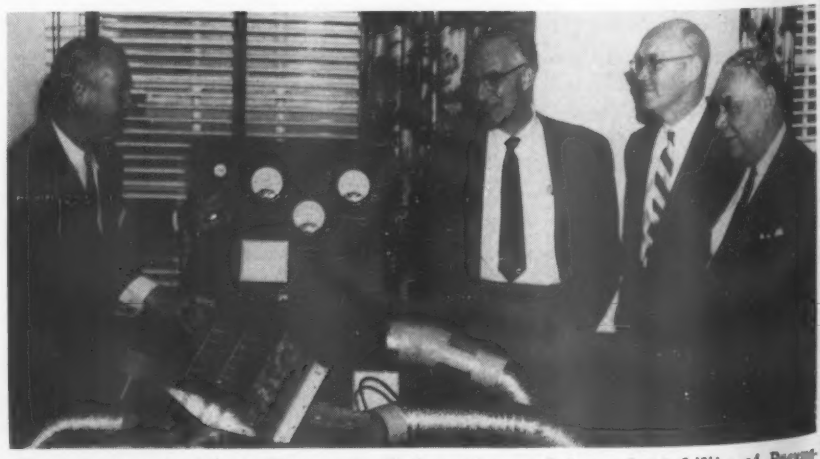
The promotion, which MCA supports, will also include some studies on comparative costs of various types of systems.

Traveling Symposium Visits Engineers

A traveling symposium carrying to consulting, contracting, and industrial engineers in principal cities a useful, up-to-date explanation and demonstration of the latest air distribution, air recovery, and odor control techniques is currently being sponsored by Connor Engineering Corp.

Connor reports that more than 500 engineers attended the first three symposia staged in Chicago, Wilmington, and Philadelphia. Using working models of Connor equipment, company officials and sales engineers covered such complex aspects of air distribution as high velocity distribution, high velocity valve attenuators and application of controls to them, selection and application of air diffusers, and application of Connor's Pneumavalve for metering make-up air.

* * *



Connor vice president Henry A. Baker (l.) explains adaptability of Pneumavalve to Philadelphia engineers.

Air Engineer's Job Gets More Attention

In a paper given at the 24th annual meeting of the Industrial Hygiene Foundation in Pittsburgh, George A. Jacoby, director of personnel relations, General Motors Corp., stated that: "the ventilation engineer is gaining increased recognition. He has been able to demonstrate that he can bring about material improvement in plant environment and effect substantial reductions in costs.

"He approaches environmental control on a plant-wide basis. This includes providing a controlled air supply for temperature regulation, both winter and summer; venting of hot air, smoke, and fumes; and providing aluminum shielding from undesired radiant heat.

"These improvements have many advantages, not the least of which is better employe relations."

Jacoby said: "The introduction of new chemicals into our industrial processes will continue to pose a challenge."

Jacoby recommended that when new chemicals or new uses for existing chemicals are introduced into the manufacturing process, a chemical committee be formed.

The committee would be made up of the plant chemist, the industrial hygienist, industrial physician, safety director, and representatives of the manufacturing and purchasing departments. This committee would establish procedures to insure that no new chemical is put into use without its approval.

Industrial Health Conference Hi Lites

Older people who already have a respiratory handicap such as emphysema or dust deposits in the lungs may succumb to what would ordinarily be sub-lethal conditions of air pollution situations. This mortality is indicated through animal experimentation, according to a paper by Paul Gross, M.D.; Marian L. Estrick, Ph.D.; and James M. McNerney, M.P.H., of the Industrial Hygiene Foundation, Pittsburgh. Paper was presented at the 1960 Industrial Health Conference in Rochester, N. Y.

* * *

Also at the 1960 Industrial Health Conference, a report was made on the toxicity of liquid propellent fuels used in rockets and missiles. The report, by Keith M. Jacobson, Ph.D., director of Medical Research, U.S. Army Chemical Warfare Laboratories, Army Chemical Center, Md., covers the most widely used fuels, such as hydrazine, UDMH, aniline, ethylene oxide, n-proplyl nitrate, JP fuels, boron hydrides, and others. Copy of the report will appear in full in the Transactions of the American Conference of Governmental Industrial Hygienists.

* * *

In a report on the benzo(a)pyrene content of the air of American communities by Dr. Eugene Sawicki of the Robert A. Taft Sanitary Engineering Center, Cincinnati, it was stated that values of this cancer-causing substance averaged 16 times greater for city areas than for country areas.

Dr. Sawicki stated that in some cities the quantities of benzpyrene found would indicate that an individual breathing such air would inhale as much benzpyrene as from smoking two or more packages of cigarettes daily.

Benzpyrene, a polynuclear hydrocarbon, is believed to come principally from incomplete combustion of fuels, waste materials, or other combustible materials. It is normally found as a constituent in many tarry materials.

Benzpyrene concentrations for the first seven cities for January to March, 1959, in order of severity in micrograms/1000 cubic meters of air were given as: Altoona, Pa., 61; St. Louis, 54 (half that of same period previous year); Richmond,

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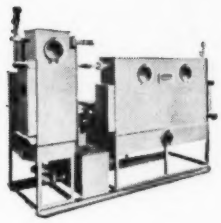

■ *Now you can control micro-organisms efficiently: Kathabar® Systems*

CUT BACTERIA

—pathogens included— to below 5 per 10 cu. ft. (as measured by the most sensitive instruments) in air delivered continuously to any hospital room.

■ *The Kathabar aseptic uses neither filters nor lights; treats the problem directly: (1) dries up all exposed water, where organisms thrive, in coils and ducts; (2) sterilizes air most efficiently and consistently.*

■ *The asepsis is odorless, and its effectiveness is not reduced by age.*

■ *Your inquiry will be given our prompt attention.*

Surface Combustion · *2394 Dorr St., Toledo 1, O.*
A Division of Midland-Ross Corporation

Send "Air Hygiene for Hospitals"

name & title .....

hospital .....

street .....

city .....*zone* .....*state* .....

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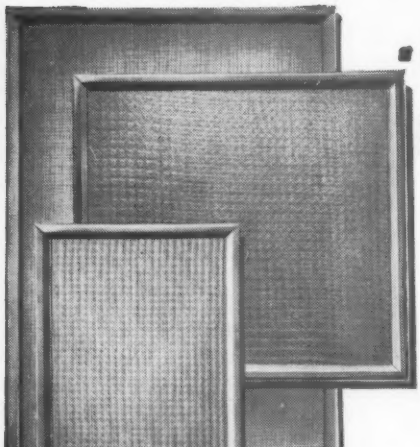
NOW Poly-Mag 80!

...and only in



DUST-magnet FILTERS

a product of

STODDARD INDUSTRIES

Poly-Mag 80 is a newly developed, highly electrostatic Polyester plastic exclusively engineered and produced for Stoddard Industries. With this new material, DUST-magnet filters are now more effective in every way . . . higher resistance to shrinkage . . . lower pressure drop . . . unaffected by humidity, or temperatures up to 230° F.

There are more advantages to stocking and selling DUST-magnets than any other filter!

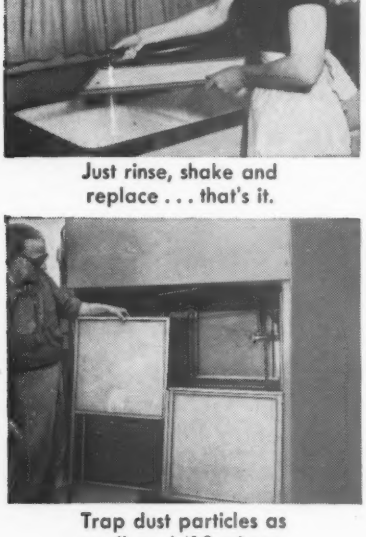
Just rinse, shake and replace . . . that's it.

CUSTOMER SATISFACTION
They are guaranteed for the life of the unit in which used . . . cleaned in minutes with no messy oil coating needed.

RETAILER SATISFACTION
Customer satisfaction . . . standard sizes . . . excellent profit margin.

WHOLESALER SATISFACTION
Models are available for residential, commercial and industrial use . . . competitively priced . . . delivered promptly.

SERVICEMEN SATISFACTION
Reduce operating costs and improve efficiency of furnace and air conditioning systems . . . ease of installation.



Trap dust particles as small as 4/10 micron.

Cleaner, fresher, purer air means less housework.

DUST-magnet FILTERS

a product of Stoddard Industries

3383 E. Layton Ave., Cudahy, Wis.

Industry News

(Continued from preceding page)

Va., 45; Hammond, Ind. and Charlotte, N. C. tied for fourth place at 39; Chattanooga, Tenn., 31 and Indianapolis, Ind., 26.

* * *

Current air pollution research in Europe was surveyed by Arthur C. Stern, chief, air pollution engineering research, Robert A. Taft Sanitary Engineering Center. Stern stated that air over European cities is, in general, visibly dirtier than the air over comparable cities in the U.S.A.

He also stated that duplication of research in air pollution control was found among the various countries, due to a lack of communications between research people caused by language barriers.

Ivan Gets Science Abstracts Fast

The Russians have a scientific technical information center without par any place in the world, according to H. J. Rand, president, Rand Development Corp., who has visited Russia.

Briefly, the center employs thousands of bi-lingual scientific specialists who prepare abstracts of the world's literature in Russian, which are distributed monthly, in 16 major subjects.

A review board of specialists publishes more complete abbreviated articles on selected topics on subjects which they consider the most important. These abbreviated articles, more comprehensive than the abstracts, are published in the form of Express Journals every 10 days.

Top priority subjects are available on machine translation from all languages, including Chinese.

An information retrieval machine is under development and in prototype form which is claimed to be able to read 10,000 abstracts an hour from a magnetic tape. These machines are to be connected by teletype wire to every major scientific institute in the U.S.S.R. in a few years, according to Rand.

Thus, when a scientist wants published data on a subject he can send for it via teletype and receive all available taped abstracts in written form within the day.

(Please turn to page 19)

NEWS of the Industry . . .

(Continued from page 16)

Tale of Two Villages

To Analyze Pollution vs. Lung Disease

A unique mass medical study of occupants of two villages located near each other in Pennsylvania is being undertaken by George Wright, M.D., director of St. Luke Hospital, Cleveland, and the U.S. Public Health Service.

Study of Seward and New Florence, four miles apart, is a mass analysis of lung disease incidence, with emphasis on emphysema, in the entire population of both communities.

In Seward there is a large power plant which burns low grade soft coal conveyed directly from a mine near the generating station. Residents complain of eye and nasal passage irritation and an acrid taste to the air. Prevailing west wind is said to sweep stack emissions over Seward. Hills hold emissions in the area.

In adjacent Florence there are no air pollution problems. Population is similar in age, social, and economic strata to Seward, but without Seward's air pollution.

Studies consist of chest X-Rays, lung efficiency tests, and medical history. So far more than 1,000 adults over 30 and school children have been tested.

San Francisco Reg. 2 Takes Effect Jan. 1

The San Francisco Bay Area air pollution control regulation No. 2, covering incineration, salvage, industrial, commercial and other combustion and contaminant-emitting operations, was enacted May 4, and all emitters must register before Sept. 1. The act goes into effect Jan. 1 next, and petitioners for additional compliance time must apply before Oct. 1.

Tolerance over specified requirements is 25 percent for five years for existing establishments, provided there is no substantial change in facilities. The most rigid requirement is Ringelmann No. 2 control of visible emissions, and as a practical matter it is expected that if this requirement is met, probably all others can be also. Penalty for non-compliance is injunctive proceedings, with the liability resting entirely on the discharger.

Ground level area monitoring is provided for, a new feature in air pollution regulation. It can be undertaken by large industrial plants or groups of plants. Widest impact of the regulation is expected to be on apartments, office buildings, commercial establishments, supermarkets and institutions such as hospitals and schools, which either have oil-fired heating systems or incinerators.

Urge Use of Floating Roofs

Floating roof tanks for gasoline storage tanks over 40,000 gals. capacity, were urged by the Louisville, Ky. City-County Air Pollution Control Board and by A. H. Rose, engineer with the U.S.P.H.S. Robert A. Taft Sanitary Center, Cincinnati.

Floating roofs are to stop hydrocarbon vapor emission from storage tanks, which according to Rose are potential health hazards.

Proposed regulation to require these roof tanks was opposed by L. C. Burroughs, Shell Oil Co. official, on the basis that there is not sufficient evidence of need for the regulation.

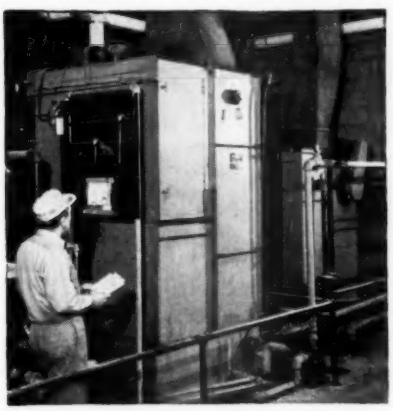
Knox, Ex-President of Research-Cottrell, Dies

James M. Knox, 56, vice chairman of the board of directors, and former president of Research-Cottrell, Inc., died May 9 after a long illness.

Knox served as president of the firm from November, 1958 until January of this year, when he resigned because of illness.

DRY and CLEAN AIR at the RIGHT TEMPERATURE

- to control your product quality
- to protect a critical operation
- to protect apparatus from moisture damage
- to DRY your material or product
- to control packing or storage conditions
- to assure precision in testing or research
- to increase air conditioning capacity



Air Condition by the NIAGARA Method Using HYGROL Liquid Absorbent

This compact method, giving high capacity in small space, removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the air.

Most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result, and always. Niagara machines using liquid contact means of drying air have given over 20 years of service. The apparatus is simple, parts are accessible, controls are trustworthy.

Most reliable because...the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

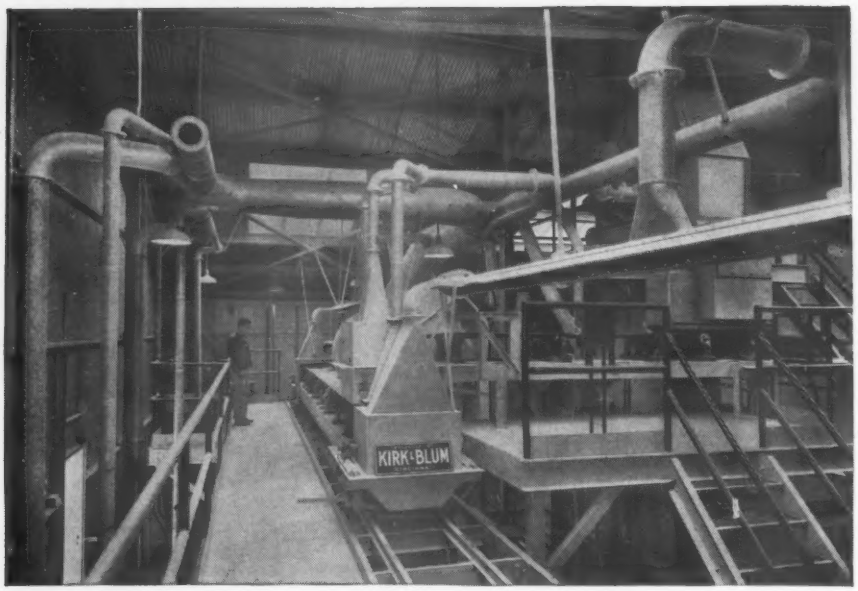
Most flexible because...you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Write for Bulletins 112 and 131 and complete information on your air conditioning problem.

NIAGARA BLOWER COMPANY

Dept. AIR-4, 405 Lexington Ave., New York 17, N.Y.

Niagara District Engineers in Principal Cities of U. S. and Canada



Every "trouble point" is protected by efficiently designed hoods and ducts.

Dust Control
saves many ways at Harbison-Walker

THOROUGH ENGINEERING of a complete dust control system for Harbison-Walker Refactories Co.'s new plant at Leslie, Maryland has resulted in operating efficiencies and other benefits well worth the time and energy required.

The installation has provided (1) dust-free plant air, (2) better operating efficiency, (3) recovery of valuable silica dust, (4) lower plant maintenance and cleaning costs, (5) better working conditions, and (6) no outside air pollution.

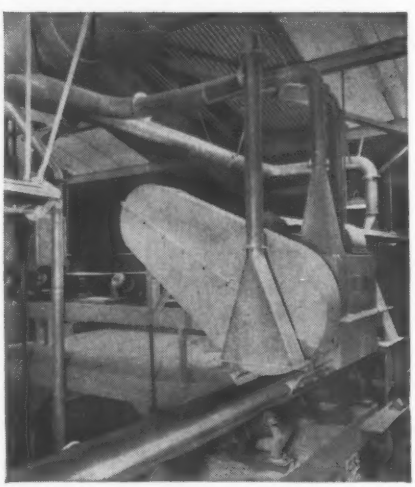
Plant-wide system keeps air clean

At every point where there is danger of dust being created or escaping into the plant, modern streamlined hoods and ducts are provided, all connected to a central system, powered by a 50 HP motor, capable of handling 25,000 CFM.

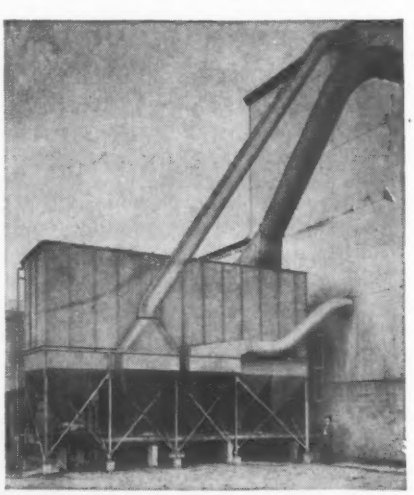
Hoods and ducts are placed out of the working area. The system collects air containing silica dust created in the processing of raw silica rock, draws it to a filter, cleans the air, and returns the collected material to bins as a product component.

Waste is eliminated and plant working conditions are kept at a level assuring greater worker productivity.

The complete installation was designed, fabricated and installed by The Kirk & Blum Manufacturing Company, Cincinnati. Information concerning Kirk & Blum Dust Collection Systems may be secured by writing to the company at 3130 Forrer Street, Cincinnati 9, Ohio.



Hoods and ducts are located so as not to interfere with working areas. Keeping plant air clean safeguards workers.



Dust laden air is cleaned in this Multi-bag filter. Recovered silica dust is returned to mixers for re-use.

Pollution Complaint$

Albany, Ore.—For odor control, Western Kraft Corp. plans to install a system for oxidizing some of the sulphur compounds developed in the process of Kraft paper making. The new installation, scheduled to be in full operation by early July, has been approved by the State Sanitary Authority. Firm has reportedly spent some $250,000 on odor abatement equipment thus far. Cost of new equipment was not given.

• • •

Youngstown, Ohio — According to city smoke control engineer Walter I. Rauth, U.S. Steel Corp. was the worst smoke offender of the first three months of 1960.

Report showed 150 emissions of dense smoke from the firm's soaking pits and four from its steam generators during the period. Other firms cited were Youngstown Sheet and Tube Co. and Republic Steel Corp.

• • •

Tucson, Ariz.—Southern Pacific Co. was object of a suit by one of the railroad's brakemen (Arthur F. Lason) alleging injury by copper and zinc dust inhaled while plaintiff was working on a freight train.

Large amounts of copper and zinc concentrates were said to have blown from gondola cars into the caboose where plaintiff worked, causing severe damage to nose, mouth, throat, lungs, and eyes. Plaintiff alleges he has been rendered incapable of performing his usual work.

• • •

Lorain, Ohio—The Lorain Slag Co. has been named as the source of odor and smoke by city councilman Leo Koba. Another councilman stated the area of the east side is near the "ghost town" stage because of smoke and odors.

• • •

Kansas City, Mo.—Solved, an odor problem caused by mercaptan fumes from the stacks of the Chemagro Corp., a manufacturer of defoliants for cotton plants.

The solution, a burner device that burns out the last of the odors before it rises from the stacks. Fumes are first washed in a caustic soda scrubber, then burned, before release from the stack.

DUST CONTROL

For All Industries

THE NEW NAPPI SANITIZER

Provides Clean Air for Your Dust Free Operation

Dirt Free Shoes Mean Dust-free rooms

- Removes *all dirt and dust* from shoes including soles, dirt and dust lodged between *soles and uppers.*
- Ideal for use in industry and hospitals. Demonstration in your plant any time.
- The *Nappi Shoe Sanitizer* features thorough cleaning action thru the use of *six* brushes (rotating) and vacuum removal of all dust and dirt.
- Guaranteed 100% efficient.
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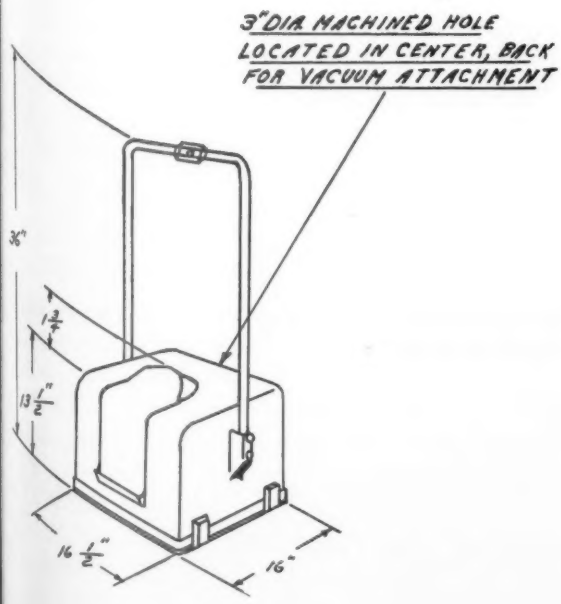

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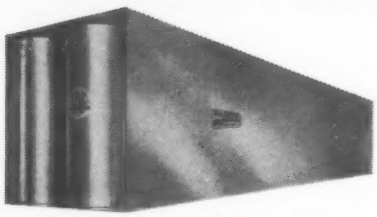

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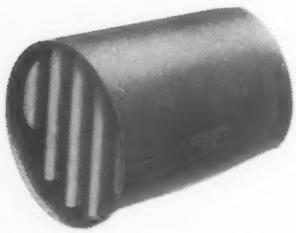

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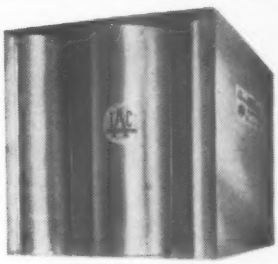

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Noise and Vibration in Air Handling Systems

These two engineering bugaboos cause serious problems in locations where decibel level is critical. Here are 14 procedures to eliminate these problems.

by Carl O. Wood
Manager, Engineering Laboratory
Westinghouse Electric Corp.
Sturtevant Div.

NOISE IN AIR HANDLING SYSTEMS is created by a number of sources. These are primarily caused by air moving over sharp edges or irregular surfaces and by vibration of surfaces set in motion either by the air flow or by mechanical means such as machine unbalance.

In almost all practical installations, air is moving in turbulent fashion through the ductwork and connecting plenums. This erratic air motion produces local fluctuations in pressure which can set in motion tremendous masses of steel plate. This may appear to be an exaggeration when one considers that the pressure fluctuations usually amount to only a fraction of an inch of water. However, two other important factors are involved – the surface area and Hooke's Law.

Hooke's Law in effect, states that the duct side will be displaced a finite amount in order to resist the forces acting on it. In the case of a flat sided duct this displacement can be quite large, resulting in noise and often in damage to the duct. The character of the noise is usually nondescript, being composed of random fluctuations rather than discrete frequencies.

14 Ways To End Noise and Vibration In Ducts

As an aid to the designer, some precautions and corrective actions against noise and vibration in duct systems are listed below:

1. *Lap duct seams* in the direction of air flow so that sharp edges are pointing downstream.

2. *Seal ducts and plenums* tightly so as to prevent leaks which not only create noise in themselves, but also allow noise to pass through from the inside of the duct.

3. *Reduce sharp edges* at the supply outlets to a practical minimum.

4. *Make duct turns as gradual* as possible and use turning vanes wherever possible.

5. *Avoid placing dampers closely upstream from a duct turn.* This applies particularly to a single leaf damper but should also be heeded for multiple leaf dampers. When the damper is partially closed the air flow may be directed toward the turn in a manner which causes excessive turbulence and noise. A minimum distance of four or five duct diameters should be sufficient for a low velocity system. A greater distance would be desirable in a high velocity system.

6. *Stiffen the duct sides* by cross-breaking or by use of angle iron or I-beam stiffeners. The larger the duct, the more important this stiffening becomes.

Adequate stiffening of ducts is often overlooked, probably on the premise that the pressure requirements do not warrant the expense. However, as pointed out above, the vibration requirements may be far more important. In some applications the stiffening members may get to be a considerable weight in order to be effective. Since straight members allow considerable deflection in relation to the amount of material used, it is advantageous to use a curved shape. Round ducts, of course, are ideal in this respect and are standard practice in high pressure air conditioning.

7. *Use flexible connections* between any mechanical component and the duct system to prevent the transmission of vibration to large panels. This includes fan, compressor and pump connections.

8. *Use vibration isolation materials* to support compressors and pumps, as well as the fan and motor section. The fan and motor should always be mounted on a single rigid support. The fan and motor will then vibrate in unison and prevent misalignment of the drive connection.

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Duct Lining Insulations

		Noise Absorption Coefficients						
		128 cps	256 cps	512 cps	1024 cps	2048 cps	4096 cps	NRC
Glass Fibre Coated Duct Insulation, 6 lb. per cu. ft.	⅝"	.09	.41	.46	.69	.76	.75	.60
	1"	.14	.45	.68	.85	.82	.78	.70
	2"	.27	.81	.95	.97	.90	.86	.90
Glass Fibre Flexible Duct Liner	½"	.16	.46	.46	.74	.83	.80	.62
	1"	.26	.56	.70	.93	.91	.84	.78
Acoustic Board	½"	.11	.42	.43	.77	.84	.82	.61
	1"	.17	.49	.76	.89	.94	.85	.77

(The above data was obtained with insulation mounted on 24 ga. sheet metal supported on 1 in. by 3 in. furring strips, 24 in. O.C.-No. 6 Mounting.)

Commercial Mufflers

	Octave Band cps					
	20-75	75-150	150-300	300-600	600-1200	1200-2400
Attenuation for a duct length equal to a duct diameter db_1	2.6	4.8	3.8	3.8	3.8	3.4

Fig. 1: *Absorption data for typical insulation and mufflers.*

(Continued from preceding page)

Heavy concrete foundations are often used in place of the vibration isolators. For best results the mass of concrete should be at least four times the mass of the rotating parts. A rigid heavy foundation is desirable even though vibration isolators are used.

9. *Where noise is a critical factor, sound absorption* should be used in the duct system. This consists of duct lining insulation or mufflers or both. Absorption data for typical insulation and mufflers are given in Fig. 1. Manufacturers should be consulted, however, for actual data.

10. *Excessive noise at fan discharge can result if equipment is placed too close to the outlet.* The air leaving a fan is flowing in the form of many vortices contained in the stream. The vector velocities are much higher than is indicated by the simple calculation of cfm divided by outlet area. Therefore, any plates or projections which interfere with this

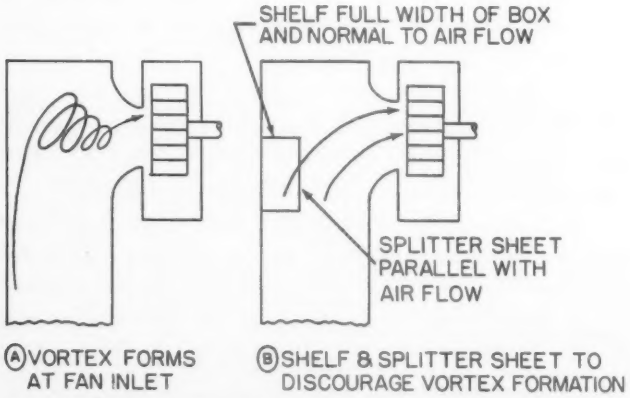
SHELF FULL WIDTH OF BOX AND NORMAL TO AIR FLOW
SPLITTER SHEET PARALLEL WITH AIR FLOW
Ⓐ VORTEX FORMS AT FAN INLET
Ⓑ SHELF & SPLITTER SHEET TO DISCOURAGE VORTEX FORMATION

Fig. 2: *Baffles placed in inlet box to eliminate vortex.*

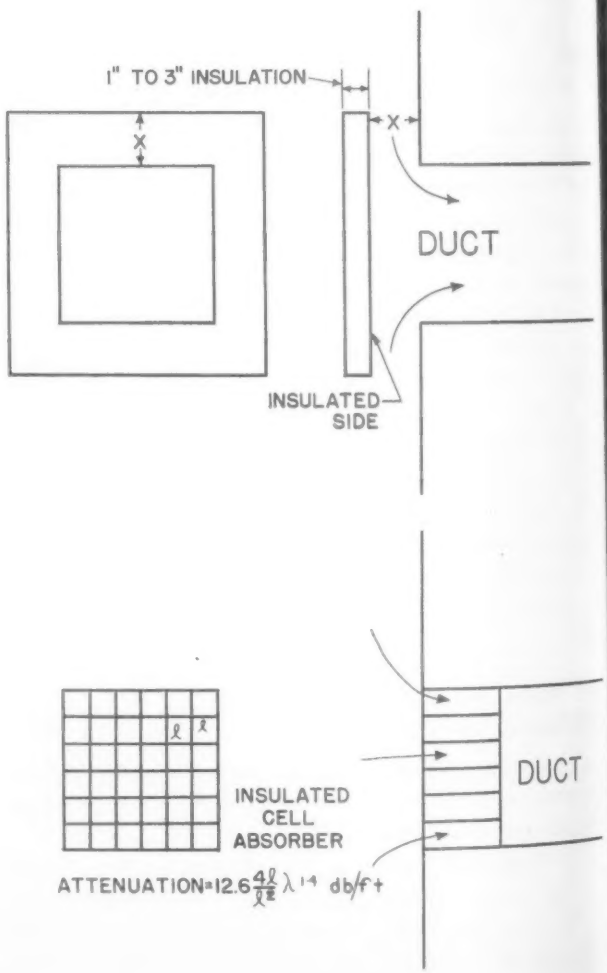

Fig. 3: *Insulating baffles.*

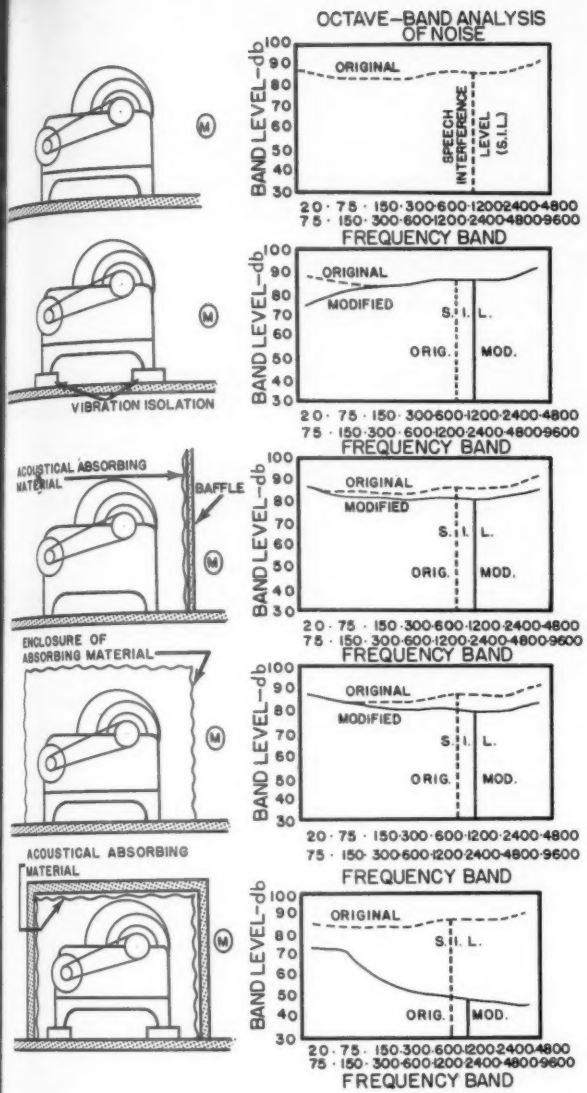

Fig. 4: *Noise reduction effects of some typical noise control measures.*

flow will most certainly produce noise. Equipment in this category includes egg crate sound absorbers, heat transfer coils, and dampers placed parallel with the fan shaft. Sound absorbers and coils are best placed four or five diameters downstream from the fan outlet to reduce noise troubles. Outlet dampers should be installed parallel with the plane of fan rotation.

11. *Pulsations in air flow* which originate at the fan usually result from unfavorable inlet conditions.

The inlet box configuration may be such that a vortex forms at the inlet and is carried through the fan where it seriously disrupts the normal fan action. This type of vortex forms at irregular intervals and gives rise to severe noise and vibration in the duct-work. Usually baffles properly placed in the inlet box will correct this trouble as illustrated in Fig. 2.

12. *Objectionable noise may emanate from supply or return air openings.* The noise may be caused by localized high velocities at the grille or diffuser or it may have been carried through the duct from sources such as vibrating duct panels, dampers or fan. Aside from correcting the noise source, which is the most desirable where possible, the noise can often be reduced by means of an insulated egg crate or baffle at the opening.

The baffle should be insulated on the side facing the opening and should overlap the opening by an amount at least equal to the spacing from the wall. This is illustrated in Fig. 3.

13. *In some cases it may be desirable to isolate the fan and motor* noise from the surrounding area. Fig. 4 illustrates the noise reduction effects of some typical noise control measures as reported by the General Radio Company. Note that effectiveness of the enclosure will depend on the frequencies in the noise spectrum of the equipment involved. Fan noise is primarily in the lower end of the spectrum.

14. *Do not overlook the transmission of noise through the duct system to adjoining rooms.* Insulated baffling or an indirect insulated section of duct will usually overcome this problem. Return air openings into noisy hallways can defeat an otherwise quiet installation. These should be baffled acoustically to prevent the noise transmission.

In order to estimate the noise reduction measures required in an installation it is necessary to know the expected noise level in areas to be served. Although the definition of an acceptable system noise level is open to much debate and will depend on the application, a usually acceptable system noise level will be *five decibels or more below the ambient level.*

In the more quiet installations, speech interference level may be the criterion, or the limiting factor may be that the original ambient level is not increased by the system noise. In the latter case, the system noise would be ten or more db below the ambient level. Fig. 5 shows the effect of adding the system level to the ambient noise level.

The amount of absorption to be installed in the duct can be estimated from the fan noise level and frequency spectrum.

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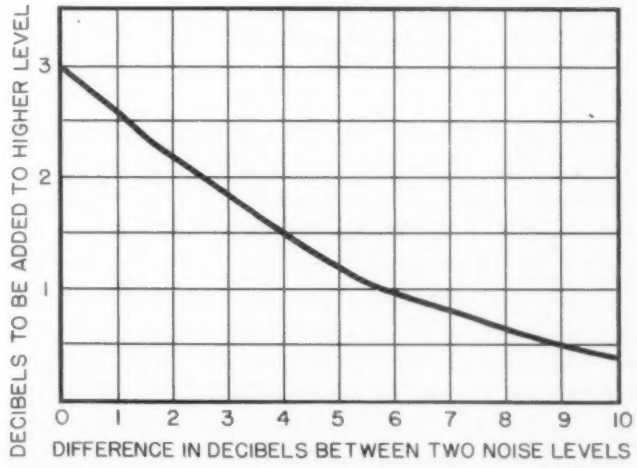

Fig. 5: *Effect of adding system noise level to ambient noise level.*

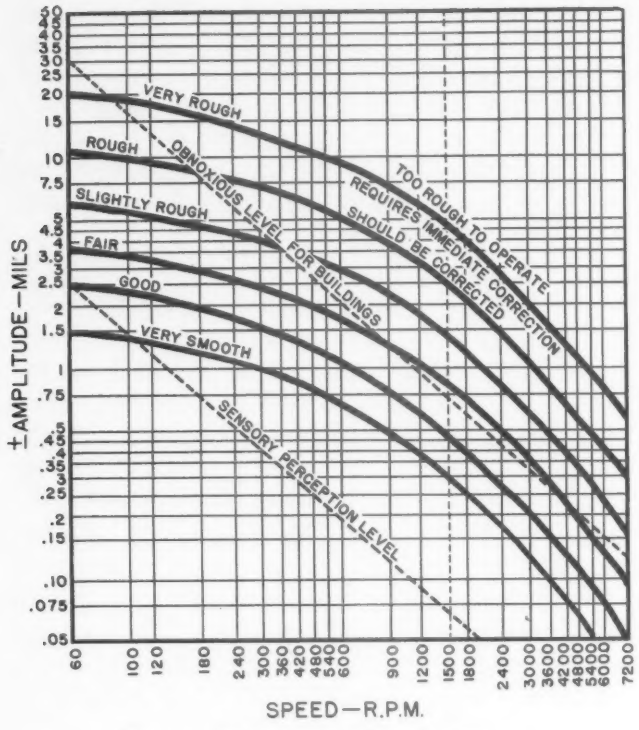

Fig. 6: *Guide to vibration tolerance.*

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Duct attenuation is given by the empirical formula:

$$\text{attenuation} = 12.6 \frac{P}{A} - \lambda^{1.4} \text{ db/ft.}$$

where P = perimeter, in.
A = cross sectional area, sq. in.
λ = absorption coefficient for liner material.

Absorption coefficients for several materials are given in Fig. 1.

Absorption coefficients are given for particular frequencies. Where the noise spectrum of the source is known, the reduction of decibels can be calculated for each frequency band. The over-all level can then be figured by combining successive pairs of noise levels using Fig. 5. Note that the combination of noise levels is a logarithmic function. Thus the combination of 50 db and 52 db results in a level of 54 db.

For general noise reduction calculations an average coefficient is used. This is called the Noise Reduction Coefficient and is the average of coefficients for frequencies of 250, 500, 1000 and 2000 cps.

A number of commercial sound absorber designs are available for use in ductwork. The manufacturers should be consulted for the performance of their units.

The absorption in unlined metal ducts is essentially negligible except for very long ducts. However, there will be some attenuation at duct turns, branch takeoffs, and openings into plenum chambers and rooms.

The attenuation at plenum or room openings is given by the formula: attenuation $= 10 \log_{10} \frac{A_p \times \lambda}{A_o}$

where A_p = surface area of plenum or room, sq. ft.
λ = absorption coefficient
A_o = cross sectional area of opening, sq. ft.

Vibration Isolation

Vibration in fan and duct systems manifests itself in increased noise and can produce troublesome maintenance problems. A rigid fan foundation is an important requirement for low vibration. When this requirement is fulfilled, other provisions for vibration reduction can be properly attained.

Good fan balance is a prime requisite. Fig. 6 is a chart prepared by Mr. T. C. Rathbone of Fidelity and Casualty Company, of New York, as a guide to vibration tolerance. The vibration amplitude should be measured with a good quality vibrometer placed against the fan bearings.

Vibration isolation procedures are intended to confine any equipment vibration to the equipment itself by reducing the force transmitted to the support.

The transmissibility of an isolating system is a function of the ratio of the forcing frequency to the natural frequency of the vibrating equipment on its mounting. The forcing frequency is the rpm of the fan. The undamped natural frequency of the equipment and mounting is calculated from the static deflection of the mounting.

$$f_n = 188 \sqrt{\frac{1}{d}}$$

where f_n = natural frequency, cycles per minute
d = static deflection in inches

This formula is a simplification which assumes a single mode of vibration and also that the isolator material has the same type of elasticity under both static and dynamic conditions and that its force deflection characteristic is a straight line. Although most vibrating systems are not this simple, the method is

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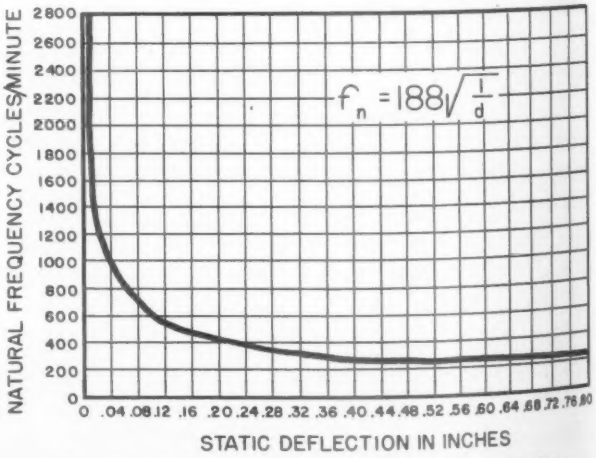

Fig. 7: *Natural frequency vs. static deflection.*

How Air Is Handled At Idlewild . . .

by Charles Broder
Mechanical Engineer
The Port of New York Authority

PART II

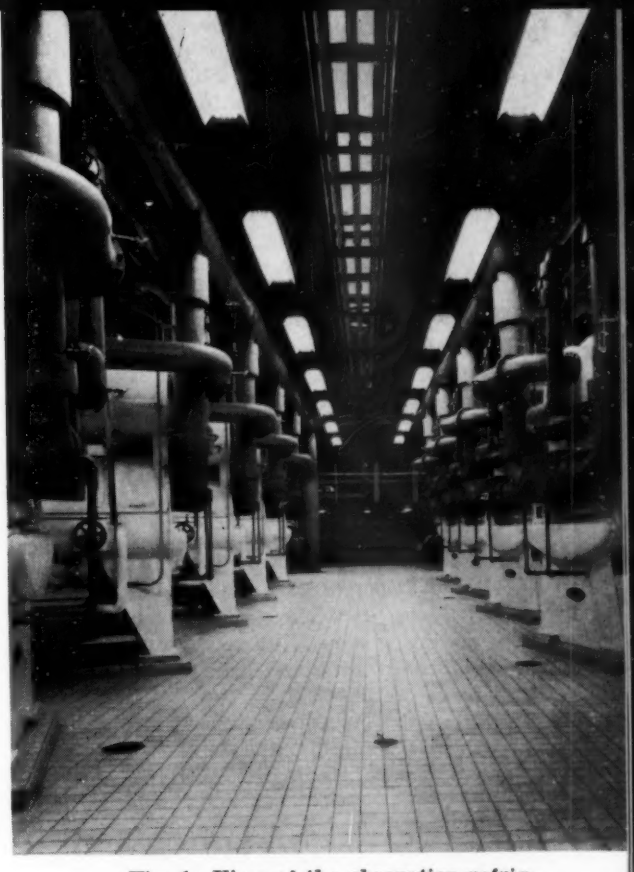

Fig. 1: *View of the absorption refrigeration equipment in the central utility building at New York's famed Idlewild International Airport. Photo Port of New York Authority.*

Concluding installment of this article describes in detail the air conditioning systems in each of several terminal buildings at the airport, showing how different consulting engineers handled the air distribution systems.

SAID TO BE ONE OF THE WORLD'S largest aircraft handling facilities, famed New York Idlewild International Airport has individual terminal buildings for seven major airlines plus many other extensive buildings.

Last month we described distribution of HTHW and chilled water from a central plant to each building. This month we take up the air distribution in these buildings. While some buildings were designed by different architects, and their air distribution systems designed by a different consulting engineer, there are many points of similarity as well as differing techniques of interest to the air engineer, as far as heating and cooling is concerned.

United Terminal

The crescent-shaped terminal recently placed in operation by United Airlines is a two-story building and has 250,000 sq. ft. of space. Spacious, it has all of the necessary passenger conveniences in lounges, waiting rooms, retail shops, dining areas and the offices and operating facilities for the airline's operations.

There are 54 air systems for air conditioning, heating and ventilation throughout the building ranging air flow from 1500 cfm to 35,000 cfm. These are of the conventional type, under 2500 fpm outlet velocity and 2½ in. w.g.

Main building has heating and air conditioning for public areas and concourses, restaurants, offices, shops and operational facilities. Electrostatic filters maintain air cleanliness. About twenty-one systems have complete heating and cooling while the remainder heat and ventilate or provide ventilation only.

The United loading finger has 10 air systems. Five are complete heating and cooling systems, the remainder are used for heating and ventilating specific areas, all using electrostatic filters.

The Delta Airline finger has four air systems, two of which are heating and cooling and two are only for heating and ventilating. All systems use electrostatic filters.

Chilled water is used in cooling coils with entering water temperatures at 45F and using from 15 gpm to 170 gpm in different systems. Heating coils are operated in secondary hot water ranging from 110F and 150F when controlled by outdoor thermostat and reset through submaster control from 55F to 0F outdoor air. Hot water flow through the coils ranges from 3 gpm to 55 gpm in differ-

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ent systems. Radiation is installed around glass perimeters.

Unit heaters, with entering hot water temperatures about 200F, serve vestibules, cargo areas, utility rooms and corridors.

American Terminal

The American Airlines Terminal is a spacious three story building with 125,000 sq. ft. of space. It is one of the most colorful, with a front facade containing some 7,360 sq. ft. of stained glass window. Multi colored tile patterns in the interior and the use of glass walls in many sections of the building bring out a rich pattern of color.

At the areas of large glass exposure along exterior walls are fin tube radiation served by secondary hot water to minimize effects of the glass on heating of the area. Radiators are equipped with automatic valve control.

In all, there are 14 air systems in the building. Of these 11 are heating and coiling units complete with heating and cooling coils, electrostatic filters and provision for charcoal decontamination for future installation if desired. Three of the systems are ventilation units, one of which has a provision for reheat, and all three systems have high efficiency mechanical filters.

Complete heating and cooling is provided for the ticketing areas, lobby, offices, concourses and restaurant areas and the various passenger frequented areas. The air systems are of the conventional type, with air distributed at velocities under 2000 fpm and at 3 in. w.g. Air ranges in capacities from 20,000 cfm to 40,000 cfm in the various systems. Hot water through coils enters at 250F and leaves at 210F while varying from a capacity flow of 1 gpm through the smallest system to 50 gpm in the largest system. Similarly, chilled water flow through the cooling coils varies from 46F entering to 55F leaving while the rate of flow in the smallest system is 10 gpm and the flow rate in the largest system is 270 gpm.

Unit heaters and high velocity units are utilized for heating baggage areas, machine rooms, trash rooms, cargo handling areas, stairways and similar areas, under thermostatic control.

One unique feature is the use of a horizontal air door in the main vestibules in conjunction with exterior doors. This is a different type than is generally seen in this particular application. This design makes use of the interchange of static and velocity pressures to bring about a primary nozzle ejection across the vestibule entry to return grilles on the door return in the vestibule. Air temperature is under thermostatic control and varies automatically as required for comfort.

Fig. 2: *American Airlines terminal is one of the most colorful on the field and employs 14 air handling systems in its 125,000 sq. ft. of space. Feature is an enclosed jetway that permits passengers to move from plane to lounge without exposure to outside elements. It can be seen here just back of the plane's nose.*

Another installation is the snow melting system in the main ramp to the building. A thermal oil especially prepared for snow melting use is the secondary fluid in the system.

The larger of two machine rooms has main heat exchangers for heating secondary hot water for heating, the snow melting system and the bulk of the domestic hot water. It accounts for about 85 percent of the installed building load for HTHW and all of the chilled water to the building. Second machine room, with a second HTHW line from the plant, accounts for hot water and steam requirements of the restaurant areas.

Eastern Airline Terminal

The Eastern Airline Terminal is the largest of the individual terminals. It is a three story building with 361,280 sq. ft. of floor space. Spaciousness and convenience for passenger travel is built into the entire structure.

The exterior surface of the building has more than 141,000 sq. ft. of glass, much of it tinted to eliminate glare and reduce some of the sun heat load in certain areas.

There are 26 air systems in the building. Of these, there are 7 dual ducts and 19 of the conventional type. All of the systems have cooling coils and rotating media filters. Only 18 have reheat coils and none have preheat coils.

The dual duct high velocity systems supply conditioning to all of the offices. The dual duct systems range from 10,000 cfm to 35,000 cfm against 5 in. to 6 in. w.g. and outlet fan velocity of about 3400 fpm.

Conventional systems, under 2600 fpm, range in capacity from 5000 cfm to 30,000 cfm against static pressures of 1¾ in. w.g. Hot water flow through heating coils ranges from 210F to 180F, with a flow rate from 5 gpm to 90 gpm. Chilled water flow through coils ranges from 45F to 55F. Flow rate through coils in the systems varies from 30 gpm to 265 gpm in the largest system.

Unit heaters and high velocity units are used to heat vestibules, cargo areas in the fingers with water temperatures entering at 210F.

Fig. 3: Main lobby of American Airlines passenger terminal shows 30 ft. high glass wall affording a panoramic view of the field. Fin tube radiation heats the glass area. Unique feature is use of a horizontal air door in main vestibule in conjunction with exterior doors.

Along the exterior glass walls, fin tube radiation is used except in the fingers which are heated only by air.

In the several vehicular ramps, service courtyards, passenger exits to apron areas and similar areas, an extensive snow melting area has been installed, covering in all about 76,000 sq. ft. Secondary fluid for this system is ethylene glycol and water and this mixture is heated in a snow melter heat exchanger when required.

Pan American Airline Terminal

The Pan American Airline Terminal, now under construction, is probably one of the most unique constructions in Terminal City. This three level terminal with a floor area of 100,000 sq. ft. is shaped like an umbrella and has a 176,000 sq. ft. cantilever roof fanning out over the center core like an open umbrella.

The projected roof will be able to offer complete cover to six big jet airplanes, allowing passengers to embark or disembark protected from the elements. The entire exterior wall will be glass, except about 89 ft. of the perimeter, which will be an air curtain.

The air curtain is an innovation for this type of application in so large a building. The departing passengers go through the air curtain at the entrance of the terminal. The air curtain, operated by 6 centrifugal fans, circulates a total of 600,000 cfm from roof ducts vertically to floor ducts. Air is recirculated through hot water coils for a designed heat loss of 8,000 MBH.

Hot water flow through the coils ranges from 250F to 210F with the water rate flow through the coil at 400 gpm. Air velocity is designed for 1300 fpm above 7 ft. from floor level. The curtain is designed to permit temperature of the air to be same as air in main space of the building and permit passengers to enter unencumbered by baggage problems at doors.

There are a total of 17 air systems for heating, ventilating and air conditioning the building, exclusive of the air curtain. Included in these are 8 systems at aircraft loading positions.

Systems for all the office spaces, fingers, restaurants and the public spaces are conventional, with outlet velocities under 2100 fpm. Air capacities vary from 6000 cfm to 30,000 cfm against 2 in. w.g. Heating coils have a range from 250F to 210F while circulating water from 1 gpm in the smallest coil to 60 gpm in the largest coil. Chilled water ranges from 45F to 57F, with a flow rate of 50 gpm to 300 gpm in the largest coil.

Special built-up air handling units with direct expansion coils and hot water heating coils are used at plane positions for heating and cooling of planes prior to departure. Special refrigerant compressors and auxiliaries are used in connection with the direct expansion coils. Air capacity of 3000 cfm at 16 in. w.g. is ducted through transite ducts under the aprons to the plane service pit.

All the air systems use high velocity cleanable filters of the permanent type.

Unit heaters serve the baggage areas, service areas, vestibules and other areas throughout the terminal that are not serviced by the other air systems.

The HTHW and the chilled water is furnished to the building through a basic machine room and is similar to all the other terminals in type of equipment and service and control. The remaining mechanical equipment for distribution is located in equipment rooms for the remainder of the building.

Trans World Airline Terminal

The Trans World Airline Terminal, now under construction, will be novel and startling, architecturally, and yet will fit in with the concept of the Terminal City. The roof design has a swooping wing effect and symbolizes "flight," which is what the airline and the architect wanted to portray. The "wings" are almost entirely of glass around the exterior perimeter to enable passengers to lounge comfortably in the main waiting room and view the field.

There are eight air systems in the building furnishing heating and cooling for most of the terminal and the fingers. These are conventional, with air velocity under 2000 fpm. Air capacities of units range from 10,000 cfm to 50,000 cfm with static pressures from 1½ in. to 3 in. w.g.

Hot water coils range from 250F to 210F; water rates range from 10 gpm to 175 gpm per coil. Cooling coils are supplied with 46F chilled water and the flow rates through the coils range from 70 gpm to 460 gpm.

Sections of finned tube radiation supply heat along some areas of the outside walls, but all blend into

(Please turn to page 46)

Are You Getting Your Money's Worth of Air from your Fans?

By C. J. Trickler
Chief Engineer
New York Blower Co.

Through diagrams and pictures author shows what happens to system performance when wrong installation method is used, and how to install blowers correctly.

PROPER FAN SELECTION for a specific task requires knowledge of fan performance curves and system curves in addition to conventional knowledge of such mechanical factors as power requirements and duct design. Attempting to obtain a margin of safety by choosing "the next larger size" of machinery does not apply to fan selection. Rather, it is usually best to undersize fans.

Before we get into ways and means of installing fans for maximum performance, a general outline of fan types and their characteristics will aid in understanding reasons why seemingly minor errors can cause major reductions in fan efficiency.

There are three basic types of centrifugal fans . . . radial blade, forward curved and backwardly inclined. The flat blade of the radial fan tends to throw material from its surface, and so is used to handle abrasive, sticky or bulky materials that are airborne. It also has the strongest wheel and is used for fast running speeds to develop high pressure.

Radial blade fan performance curve is shown in Fig. 1. Notice that cfm is plotted across the bottom, static pressure up the left side and brake horsepower up the right.

Fan curves are developed by operating a fan at a constant speed while changing its system to establish operating characteristics from blocked off to wide open. The curve in Fig. 1 shows performance of a radial blade 40 in. dia. wheel at 889 cfm selected to move 10,000 cfm against 6 in. static pressure.

The radial blade fan is noted for its extreme stability of operation from completely blocked off to wide open and for its steadily rising horsepower curve. Mechanical efficiencies usually run somewhere in the neighborhood of 60 to 75 percent.

Forward Curve Fan Performance

The forward curve fan has a steeply rising horsepower characteristic, as shown in Fig. 2. Any error in system calculation, or later change in system operation, can cause a great increase in horsepower requirement. Motors for these fans must be sized generously.

As Fig. 2 shows, at 10,000 cfm and 6 in. S.P., the fan illustrated would require 15.6 brake horsepower. You would probably use a 20 hp motor, but even this much oversizing would permit but a small change in the system.

Because the forward curve fan runs at slower speeds than other types of fans, it tends to be quiet.

Backwardly Inclined Fan Performance

Principal design advantage of the backwardly inclined or power limiting (IPL) fan is the manner in which it develops its energy, which is most efficient. Efficiencies run from 75 to 85 percent.

Principal design advantage of the IPL fan lies in the shape of its horsepower curve. Unlike the radial blade or the forward curve blade fan, it rises to a peak and levels off.

Since this peak is not too much higher than the horsepower required at point of maximum efficiency, it is not uncommon to select motors to cover the peak. This allows the fan to operate against a varying or poorly calculated system without concern for overloading the motor. It is particularly valuable for process work where varying resistances or air volumes are used.

The fan in Fig. 3 was selected for the same performance as the forward curve fan, but while it was necessary to use a 20 hp motor on the forward curve fan to allow for even a small change in operation, this fan is completely covered with a 15 hp motor. Its steep capacity curve minimizes the effect of system changes.

When two sizes of fans are selected for the same operation (Fig. 4), the smaller fan must run relatively faster than the larger one. In so doing, it develops a higher peak static pressure which in turn gives it a higher pressure reserve and allows the smaller fan to deliver more air at a higher pres-

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Trickler

sure than the larger one. To deliver maximum performance, however, a fan must be installed properly, and due attention must be given to the system as a whole.

Techniques of installing fans properly can best be demonstrated pictorially to show what happens when a given "wrong" method is used. For the balance of this article we will use pictures, drawings and charts to explain proper fan selection and installation, and the penalties attached to improper installation. ▲▲

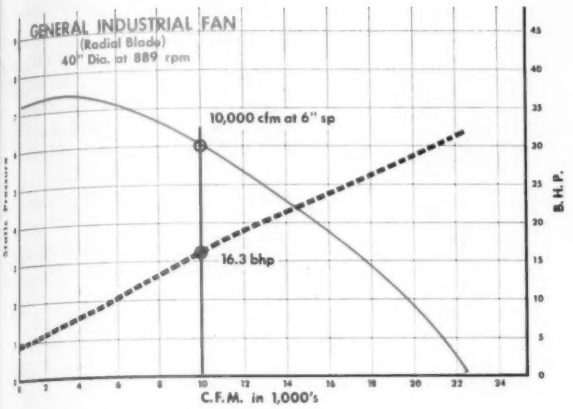


Fig. **1**: *Radial blade fan performance.*

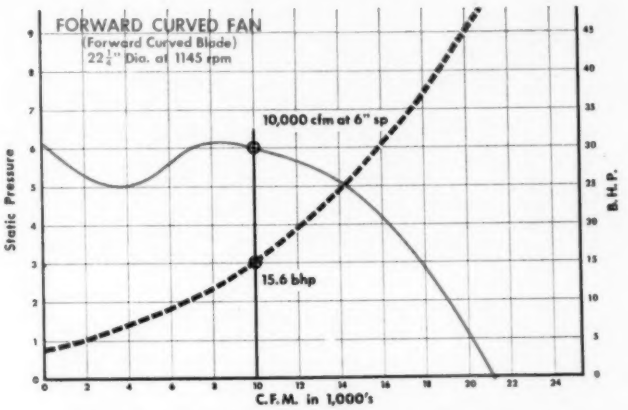


Fig. **2**: *Forward curve fan performance.*

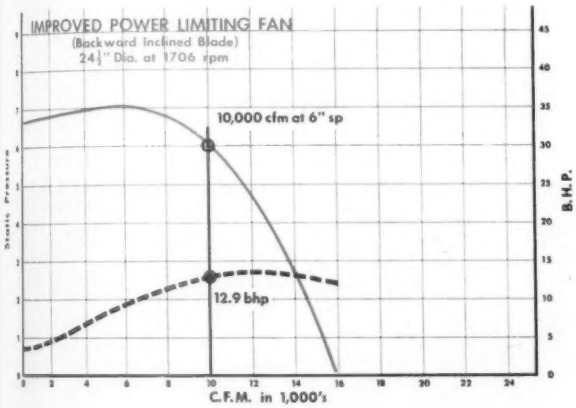


Fig. **3**: *Backwardly inclined fan performance.*

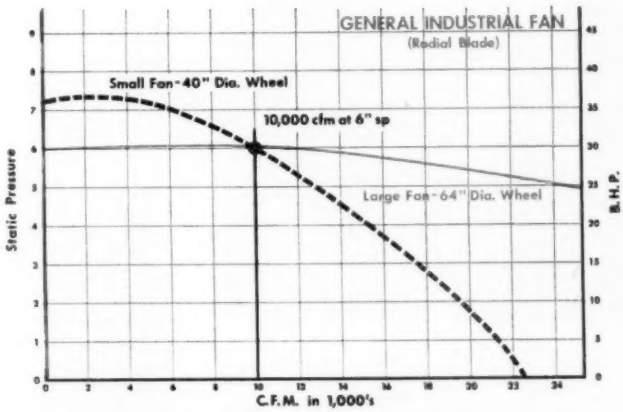


Fig. **4**: *Two sizes of fans for same operation.*

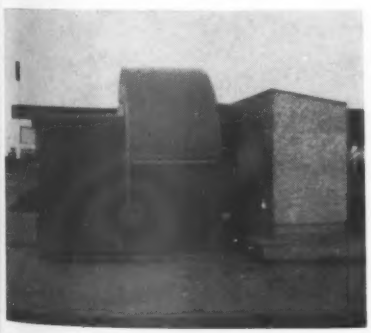


Fig. **5**: *This roof-mounted ventilating fan cannot deliver its rating because the inlet connection at right forces the air to go around a corner. Since air has weight, it tends to slide to the outside when turning a corner; thus, 70-90 percent of the air entering this fan's inlet is trying to squeeze through the top half of the inlet.*

Fig. **6**: *It is possible to demonstrate the several effects of system design on fan performance. Here, for example, is a small fan which would sell for, say, $100 and which can be said to deliver $100 worth of air when operating under optimum conditions. There is no inlet connection on this fan; as soon as we begin to add connections, we will obtain variations in fan performance and air delivery.*

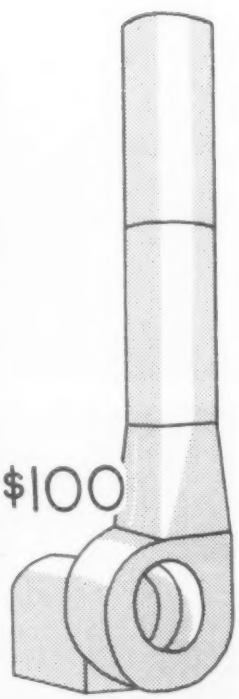
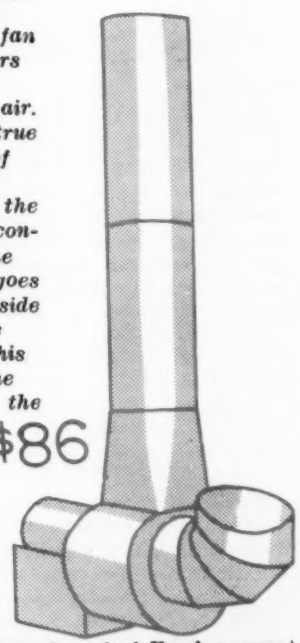


Fig. **7**: *When an inlet elbow is attached, capacity drops 14 percent and the fan now delivers only $86 worth of air. As was true of the roof ventilating fan with the poor inlet connection, the air here goes to the outside during the turn—in this case to the bottom of the elbow.*



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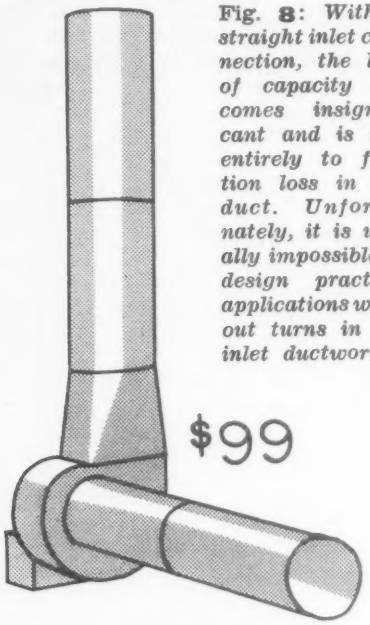


Fig. 8: *With a straight inlet connection, the loss of capacity becomes insignificant and is due entirely to friction loss in the duct. Unfortunately, it is usually impossible to design practical applications without turns in the inlet ductwork.*

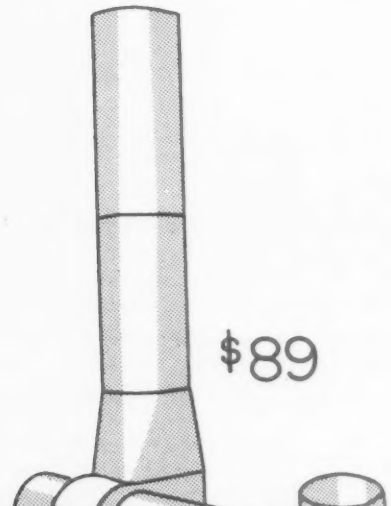


Fig. 9: *One practical approach is to put a straight length of duct between the elbow and the inlet. This gives the air a chance to fill the duct evenly before entering the fan inlet. When the straight run is equal in length to 2-3 diameters, this fan will deliver $89 worth of air. Increase the length of the straight duct to 5 diameters and performance is increased to 91 percent of full rating.*

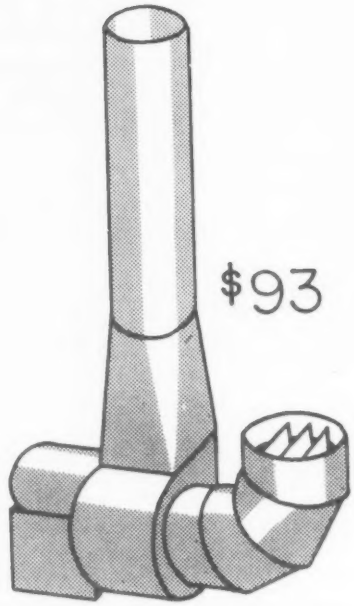


Fig. 10: *Actually, any turn near a fan inlet should be vaned. Vanes serve to prevent eccentric air flow at the inlet, and offer the best approach when it is necessary to have a 90° turn at the inlet. Vanes are not used if the system is moving solid material.*

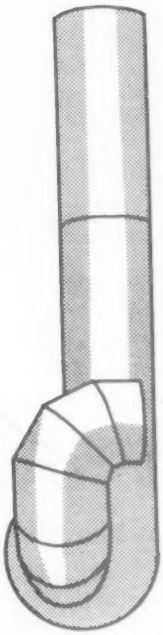


Fig. 12: *Inlet connections may set up a spiral flow into the fan. Here two elbows will make the air spin in the same direction that the wheel is rotating. Spinning also occurs in plenums when fan inlets are not aligned with the plenum inlet, or when inlet boxes are not symmetrical. When air is set to spinning in the same direction as the fan wheel is rotating, the fan behaves as though it were running at a slower speed. Spinning has resulted in a 17 percent drop in efficiency here.*

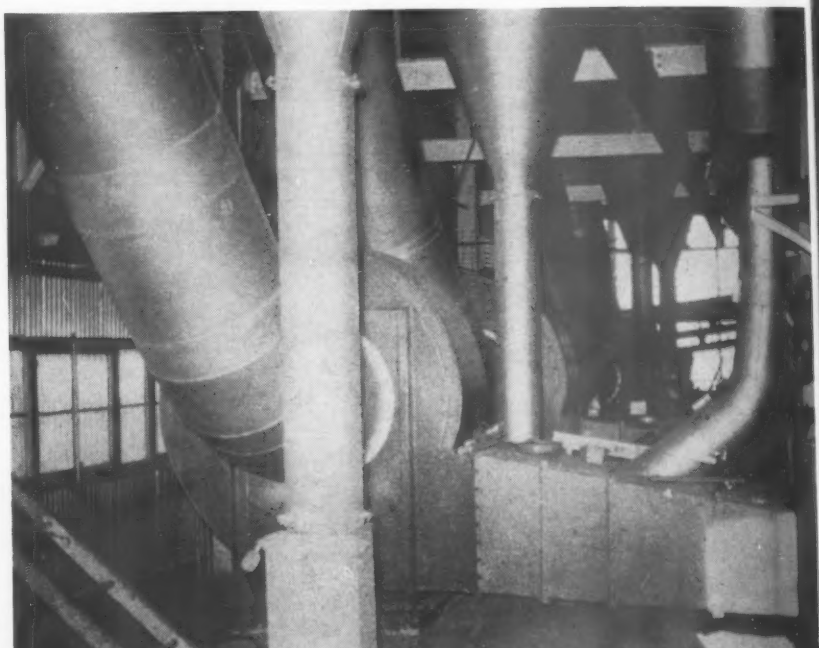


Fig. 11: *Where limited space prevents straight inlet connections, preliminary testing on a laboratory scale will usually indicate suitable design for the application. The elbow design in this bank of fans in a coal cleaning plant was developed on a small scale and has proved successful.*

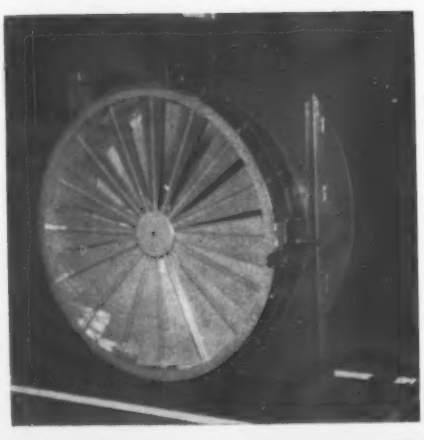


Fig. 13: *It is possible to put spinning to good use. Here is a fan with an inlet damper which deliberately spins the air in the direction of fan rotation as a means of controlling air delivery. Many dust collectors work because they are spin-creating devices.*

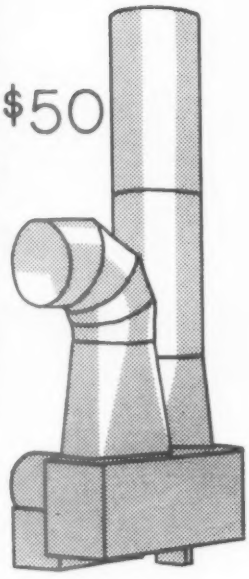


Fig. **14**: *In some cases, space limitations make it impossible not to create spinning conditions, as with this unvaned inlet box and elbow. This is an answer to a tight space problem, but an expensive answer since half the fan capacity is lost.*

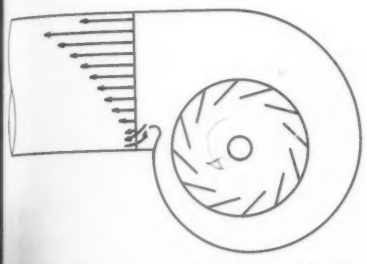


Fig. **15**: *Diagram of outlet velocity vectors from a centrifugal fan depicts the non-uniformity of the air stream which accounts for some of the phenomena encountered in installed systems.*

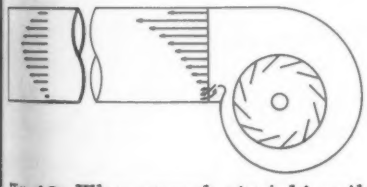


Fig. **16**: *When enough straight path is provided, the velocity vectors become more pattern-like. Full static pressure of the fan is not developed until several diameters from the fan. If the duct does not allow the high velocity streams to slow down gradually, the fan loses capactiy.*

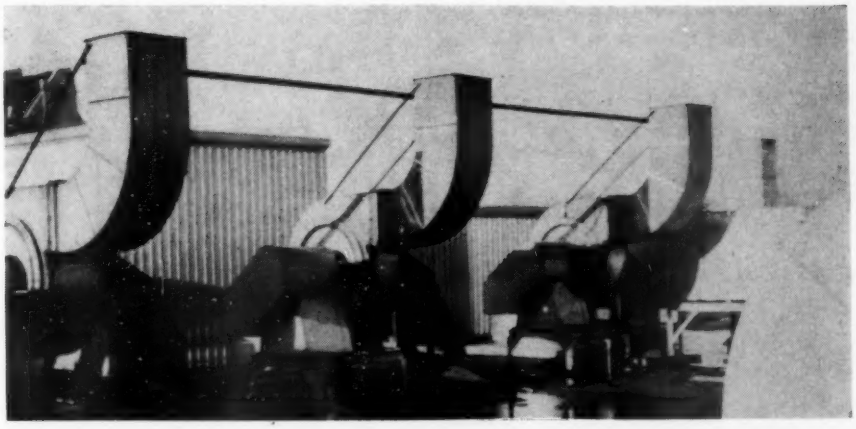
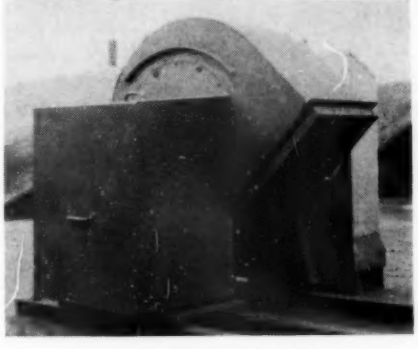


Fig. **17**: *These discharge elbows force the air to impinge on the side and create turbulent flow. The system will never allow the fan to develop its full capacity.*

Fig. **18**: *This stack (far right in Fig. 17) gives the fan a better chance. Inlet connections on these fans are poor due to space limitations. When such is the case, their adverse effect can be foreseen and allowances made in other parts of the system design.*



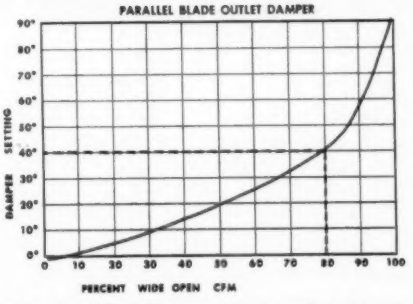


Fig. **21**: *Performance of outlet damp- with parallel blades. In operation the damper creates resistance and forces the fan to operate farther to the left on its performance curve. If damper is partially closed, less air flows through the system, but the fan operates at a higher pressure. Parallel blade outlet dampers are most adaptable to process work where large variations in volume are required.*

Fig. **20**: *Outlet damper on fan allows controlled variation of air volumes or constant air volumes against varying resistance.*

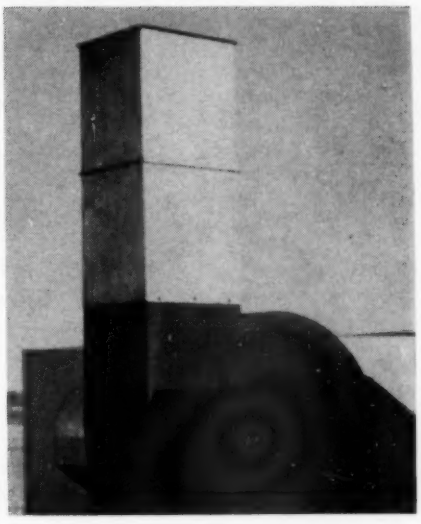


Fig. **19**: *No outlet connection on this installation causes a loss of the energy of high velocity streams. Where such an installation is mandatory, the system resistance should include an outlet loss equal to half of the average outlet velocity pressure.*

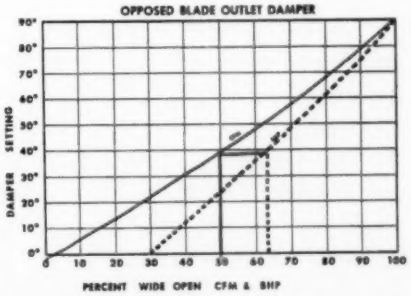


Fig. **22**: *The opposed blade outlet damper has exactly the same effect on fan performance as the parallel blade. It has the added advantage of discharging air down the duct evenly without throwing it to one side as does the parallel blade outlet damper. This fact is especially important if there are branch ducts near the fan outlet.*

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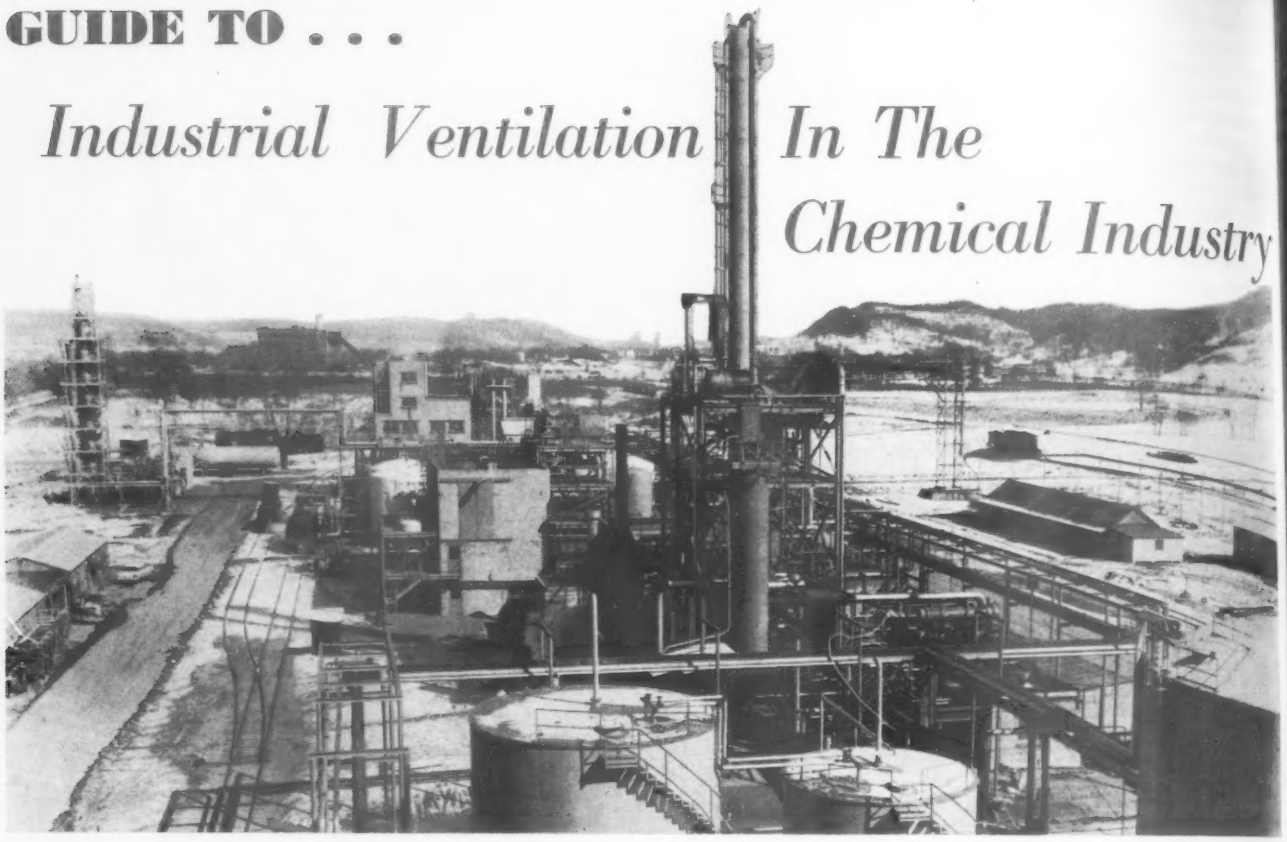
GUIDE TO . . .

Industrial Ventilation In The Chemical Industry



View of American Cyanamid Co.'s new analine manufacturing facilities at Willow Island, W. Va. Plants such as these require careful design of ventilating systems to maintain employee health.

By William V. Andresen
Chief Industrial Hygienist
American Cyanamid Co.

Introducing a new series of articles defining ventilation problems peculiar to the chemical process industry and offering means to their solution.

THE PRACTICE of the various industrial hygiene techniques, including mechanical exhaust ventilation and hood enclosure, has played an important part in the manufacture of chemical compounds for a number of years.

The commercial products manufactured and the raw materials used in this manufacture are literally countless. In the dynamic chemical industry, large amounts of money are spent yearly on research. Consequently, new products are continually being developed and manufactured. Some of these new products are used as the raw material or intermediate for other new products.

Many of these materials are toxic via ingestion, inhalation or skin contact routes. Others are irritating to the eyes, causing irritation and/or lachrymation; to the respiratory system, causing irritation in various degrees; or to the skin, causing dermatitis. Still other materials may be undesirable for nuisance or obnoxious odor reasons.

There are many different operations performed in the manufacture of chemicals by batch or continuous processes. Some of these operations are material transfer, reaction, filtration, drying, milling, screening and evaporation.

In each of these operations, there is usually a choice of process equipment which may be used to accomplish the results desired. Some of the equipment utilized is similar to that used in other industries for example conveyors, bucket elevators and screens. However, much of the equipment is designed specifically for the chemical industry.

Gases, dusts, mists and vapors may be created or liberated in the utilization of the equipment. Operators may be exposed to toxic, irritating or nuisance concentrations of various materials unless some method of control is employed.

Respirators, goggles and other personal protec-

(Please turn to page 48)

***WILLIAM ANDRESEN** is chief industrial hygienist for the American Cyanamid Co. A graduate engineer, he is vice chairman of the Bergen County, New Jersey air pollution control committee. He is also a delegate from the National Safety Council to the American Standards Association committee Z-9 on industrial ventilation. He is a member of the American Industrial Hygiene Association.*

How to Balance Big Building Air Conditioning Systems

by Sidney A. Littmann
Chief Mechanical Engineer
Giffels and Rossetti
Architects and Engineers

PART III

After balance of air flow is attained, more work may yet be necessary to meet design conditions. This final article tells of corrective measures to use.

Fig. 1: *Measuring velocity in duct with velometer. Note two hose connection to probe. Photo courtesy of Illinois Testing Laboratories, Inc.*

The importance of proper system balancing in achieving both design standards and long-term owner satisfaction, cannot be too greatly stressed.

In this last of a three-part series on balancing big-building air conditioning and heating systems, we will discuss ways and means of adjusting the system, or checking for errors in mechanical work, to correct for poor cooling or heating in individual spaces.

Previous two parts of this series discussed the role played by the architect, engineer, general and mechanical contractor in system balance, and outlined techniques of system balancing and instrumentation used.

As has been indicated, after balance of the air flow to various outlets has been accomplished, it may be necessary to do additional work before design conditions can be met.

The least desirable condition would be that, after balancing, static pressure on the fan is too high, and fan cannot be speeded up within the nameplate horsepower. In case greater temperature differentials between outlet and room air are acceptable, either an increase in chilled or hot water flow, or an increase in hot water temperature or decrease in chilled water temperature, or increase in steam pressure will result in delivery of the proper cooling or heating effect.

Air flow may be increased by speeding up the fan, if it is driven by an integral horsepower open motor, as these are normally rated for 115 percent load, continuous duty. Condition of filters, inlet vane controls, dampers, inlet and outlet louvers, and the like, should be checked, to assure that no excessive or unusual restrictions exist.

Where return fans are relied upon to assist the supply fan, operation of the return fans should be checked. Ductwork should be checked for partial obstructions (incompletely cut gaskets, construction debris, etc.). If the system is still inadequate, the designer of the system should be consulted as to the most efficient corrective measures.

Room conditions not maintained. When systems are in balance, and room conditions are not being maintained, the system and spaces it serves should be checked to determine if operation and design conditions conform. Space loads (machinery, people and lighting) should be compared with conditions for which the space was designed. Water temperatures and steam pressures should be checked to assure that they agree with the designed values.

For multi-zone, or double duct systems, "pick-off" from the heating coil can prevent adequate cooling

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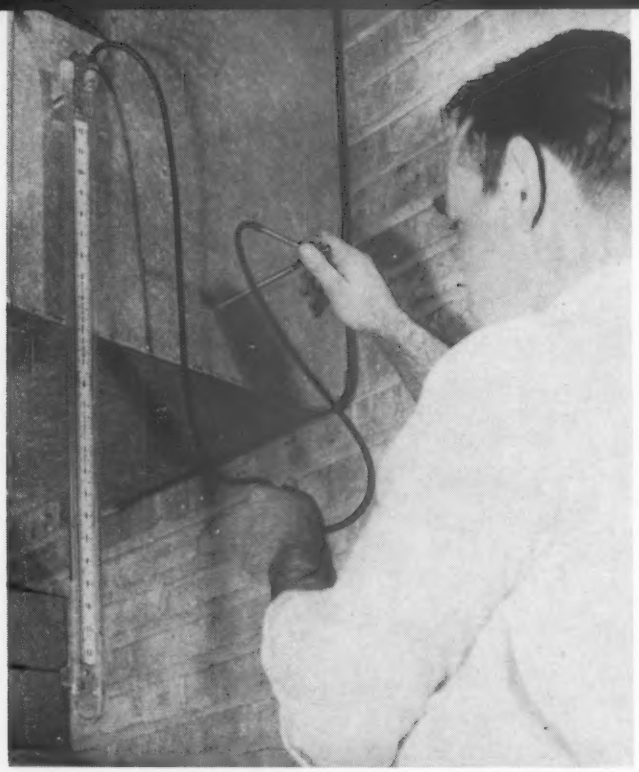


Fig. 2: *Using Pitot tube to take static pressure. Instrument is a Slack-Tube manometer of the roll up type. Photo courtesy of F. W. Dwyer Co.*

(Continued from preceding page)

during mild weather. This can be corrected by installation of a pressure plate or baffle plate upstream of the heating coil. Similarly, for these systems, mixing dampers should be checked to be sure they are closing properly on demand of the thermostat, and that there is no excessive leakage either through or around them. Excessive leakage will increase loads beyond capacity of the system to handle them.

Check Thermostat Location

On zoned systems, where some spaces are at suitable temperatures, and some others on the same zone are too hot or too cold, the first thing to check is thermostat location.

If the thermostat is located in an atypical space, it should be relocated to a more typical one. If it is exposed to solar radiation, or to direct discharge of supply outlets, or other sources of heat or cold, it should be shielded from these effects or relocated.

With present high lighting intensities, failure to maintain the same lighting utilization in all spaces in a zone can result in temperature differences between rooms of up to 10F.

Adjustment of dampers of the perimeter heating system can frequently be made to provide more equal heating for spaces served by such systems. Dampers in spaces which overheat should be closed sufficiently to reduce temperature in those spaces to the proper level.

In the event a particular space is too warm in winter and too cool in summer, flow of air to this space can be reduced to more nearly balance the heat load.

If the reverse is true, the space should be provided with more air, or supply to other spaces on the zone reduced in order to attain better temperature equalization.

Where adjustable pattern diffusers are installed, it may be desirable to reset these, spring and fall, to give horizontal pattern during the cooling season, and vertical pattern during the heating season.

Complaints of drafts. In general, complaints of drafts are the result of low room temperatures, rather than excessive air movement. Therefore, thermostat setting and calibration should be checked to assure that adequately high space temperatures are maintained.

In exterior rooms, sufficient heat should be supplied by the perimeter heating system to counteract downflow of cold air from windows and outside wall. When used in conjunction with a ventilating system, perimeter radiation should be scheduled to provide about 75 percent of heat loss from the building walls, with lights, occupants, solar radiation and the ventilation system making up rest of the heat.

If diffusers supplying air below room temperature are set to discharge downward, or if velocity is too low, cool air will blow (or fall by convection) down on occupants of the room, and complaints of drafts will result.

Minimize Negative Pressure

Where the building is under a negative pressure, as might be caused by excessive process exhaust for which insufficient make-up is provided, outside air will enter the building through cracks around windows and doors, and there will be complaints about drafts.

The suggested corrective measure here is to provide sufficient supply air to minimize or eliminate the negative pressure. This ordinarily does not result in any greater heating cost, because the additional supply air quantity is of the same order of magnitude as the amount that had to be heated as "infiltration." Distribution is improved, lower thermostat settings are possible, and complaints are eliminated. Where there is considerable leakage, consideration should be given to the use of weatherstripping.

Complaints of stuffiness. As with drafts, complaints of stuffiness are generally the result of excessive temperatures, rather than inadequate supply of fresh air. Thermostat setting, calibration and location should be checked. Causes of failure to maintain room conditions should be checked as reviewed above. Where loads have been increased, lower air supply temperatures in winter, or higher air quantities in summer, may be required. If the "stuffiness" occurs only in winter, it will be helpful to reduce capacity of perimeter radiation in affected spaces.

Much of the trouble which has been experienced

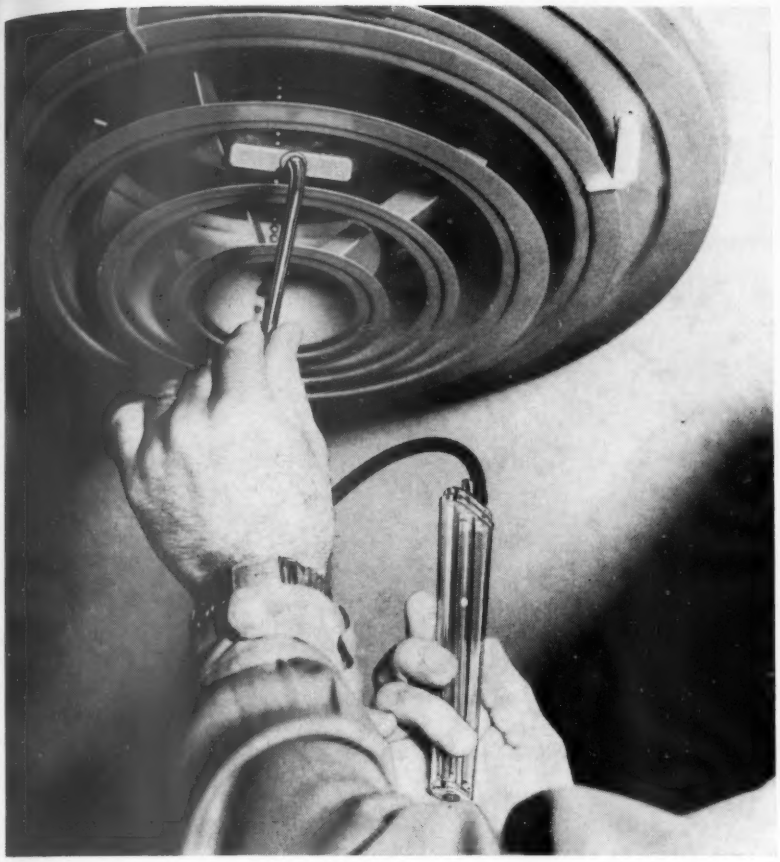


Fig. 3: *Air meter is used to measure air velocity from an air discharge grille. Photo courtesy of F. W. Dwyer Co.*

with ventilating and air conditioning systems stems from inadequate balancing. Suitable system balance may be achieved by the orderly procedure described. Suggestions were made for correction of major difficulties which may be caused by initial system unbalance, by lack of suitable data during the design of the system, or by changes in the system made during construction or at some subsequent time.

The author recommends a more universal insistence, by owner, architect, consulting engineer, general contractor and mechanical subcontractor, upon use of effective balancing procedures, in order to attain maximum benefits to all concerned with air conditioning systems. ▲▲

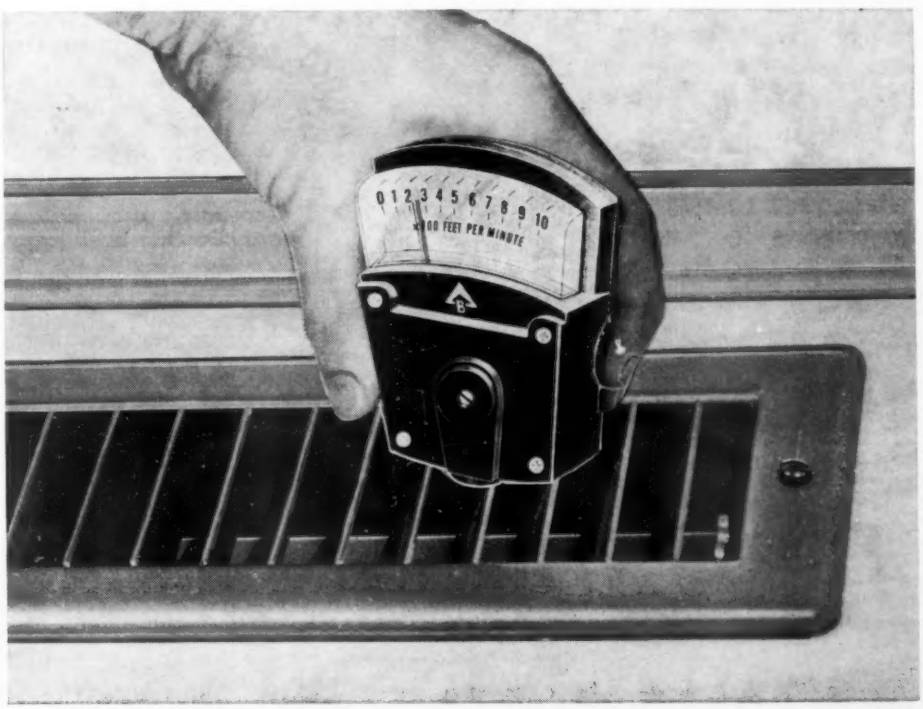


Fig. 4: *Floret air velocity indicator takes reading from floor register. Photo courtesy of Bacharach Industrial Instrument Co.*

At a cement plant bulk loading station . . .

Dust Control System Pays Its Way

Bulk loading of finely powdered cement spread dust, caused product loss, caused maintenance problems. Here's how Medusa cemented relations with its neighbors, cleared up serious pollution problem with self-cleaning dust filters.

Self-cleaning filters trap cement dust from unloading operations in Medusa Cement Co.'s Wampum, Pa., plant. Photos courtesy W. W. Sly Mfg. Co.

RECENT YEARS HAVE SEEN a noticeable trend toward bulk loading of cement into highway trucks and railway cars. Bulk loading is, of course, a great deal faster and less expensive than bagging. However, use of the method also greatly increases the possibility of excessive loss of product, and can result in a high dust concentration in the surrounding atmosphere.

By employing effective dust control systems at its bulk truck and rail car loading stations, the Wampum, Pa., plant of Medusa Portland Cement Co. prevents loss of cement. It also guards against air pollution and eliminates what could develop into a serious plant maintenance problem.

Prior to the installation of dust control equipment, there was a marked loss in cement, during both silo loading and truck or rail car loading. The dust was discharged into the atmosphere and spread over a wide area.

The problem was compounded due to the climatic conditions of the region. The Wampum plant is located in a valley characterized by frequent dampness and fog. Escaping dust settling on structural members and machinery became moisture laden. Successive layers built up, creating the problem of overloading. Cohesion of the layers made removal difficult.

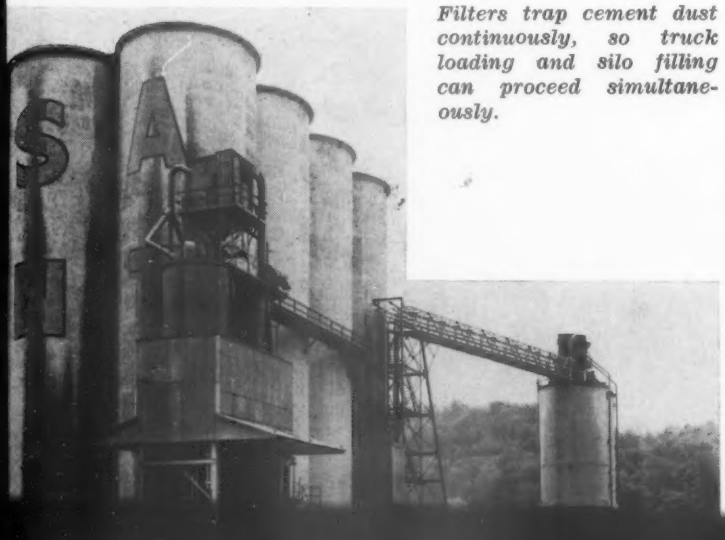
To prevent dust escape, the two silos for bulk truck loading are serviced by two continuously operating, automatically self-cleaning dust filters. The two cement silos for railway car loading are ventilated by the same type filter.

In each case, the self-cleaning, continuously operating dust filters have dual purposes: silo ventilation and collection of dust from car loading.

Because they operate continuously, the dust filters collect all of the cement that would otherwise be lost. In addition, they prevent the air pollution and maintenance problems caused by escaping dust.

Each of the two cement silos used for truck loading has three 1,000-barrel compartments. Each compartment generally contains a different type of cement. They are refilled from the main storage silos by means of pneumatic conveying lines. This is done by an operator in the control room at the storage silos.

The particular compartment being loaded is ventilated by the dust filter assigned to the task. Silo loading and truck loading can be carried on simultaneously.



Filters trap cement dust continuously, so truck loading and silo filling can proceed simultaneously.

The two continuously operating dust filters have a common wall which conserved on installation costs. However, each is an entity for greatest flexibility.

A truck is loaded in about four to five minutes. The filter collects dust from the operation and returns it to the bins. Because of the dust filter's continuously operating feature, there is never the danger of a slowdown during peak shipping periods. When shipping is spasmodic, the dust filter can be turned on or off as needed.

Each of the filters at the truck loading station has a total capacity of 5415 cfm. At the bulk loading station, the unit maintains a capacity of 1335 cfm. Loading is 10 grains. It is estimated that the dust filter reclaims about 2 lbs. of cement per minute—an hourly total of about 120 lbs.

For silo and pneumatic-conveying ventilation, the capacity is 4080 cfm. Loading is seven grains. Here the dust filter reclaims slightly over 4 lbs. per minute or an hourly total of more than 240 lbs.

Virtually the same conditions exist at the rail car loading station. Each silo here consists of a single 1,000-barrel compartment, and their contents generally are loaded simultaneously into the rail car.

The dust filters are all three-tier types—a construction that was selected because of the limited space on top of the silos. The systems are designed so that they can take care of future requirements as production expands. ▲▲

EQUIPMENT CREDIT
Dynaclone dust filters: *W. W. Sly Mfg. Co.*

Georgia Court Scans

Right To Air In Its Natural State

By Howard Newcomb Morse

Mr. Morse is a counsellor at law with offices in Chicago, and is licensed to practice before the Supreme Court of the United States of America.

MRS. R. O. MARABLE and Miss Mattie Mulligan brought an action in the Superior Court of Jones County, Georgia, against the Asphalt Products Company to recover damages for the maintenance of an alleged nuisance. The two women owned and resided in a house in Gray, Georgia. The company erected and established a plant for mixing asphalt, sand, tar, and other such ingredients used in road building within 75 feet of their house.

The operation of the plant caused a dense smoke to be given off containing tar and asphalt fumes, cinders, and fine dust. The smoke was offensive in odor, polluted the atmosphere, and impaired the health of the women. The court rendered judgment for Mrs. Marable and Miss Mulligan, and the Asphalt Products Company appealed.

Theoretically, every person has the natural right to have the air diffused over his premises in its natural state, free from all artificial impurities. If this rule were literally applied, its application would seriously disturb business, commerce, and society itself. Therefore, by air in its natural state and free from artificial impurities is meant, and the courts have so held, pure air consistent *with the locality and nature of the community.*

The use of fuel in the home, the place of business, and the manufacturing establishment is necessary. In proportion as the population grows, the impurities disseminated into the air are increased. The pollution of the air, actually necessary to the reasonable enjoyment of life and indispensable to the progress of society, is not actionable. There is legally, therefore, what might be termed a "right" to pollute the air. But such "right" is qualified in that it must not be exercised in an *unreasonable* manner so as to inflict injury upon another *unnecessarily.*

The Court of Appeals of Georgia affirmed the decision of the court below. The Court of Appeals declared:

". . . petitioners owned and occupied a dwelling house located in a *residential* section of the Town of Gray . . . and they had been residing there several years before the defendant erected and began to operate its plant within seventy-five feet of said house." Thus, the Court based its decision on two factors:

(1) the house was situated in a residential neighborhood, and

(2) the women had been living in their house before the company built and commenced to operate its plant.

The reasoning behind the decision was that under the circumstances of this case pure air consistent *with the locality and nature of the community* would be air in its natural state and free from impurities because the *nature* of the *community* in which the house was *located* was residential.

The company's "right," therefore, to pollute the air was exercised in an *unreasonable* manner so as to inflict injury upon the two women *unnecessarily* due to its having constructed its plant:

(1) after the women owned and were living in their house, and

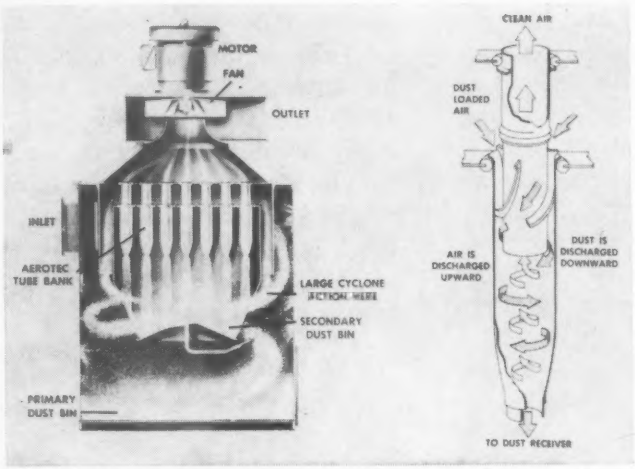
(2) within 75 feet of their house, which, as events bore out, was in much too close proximity thereto. ▲▲

New PRODUCTS

Integral Dust Collector

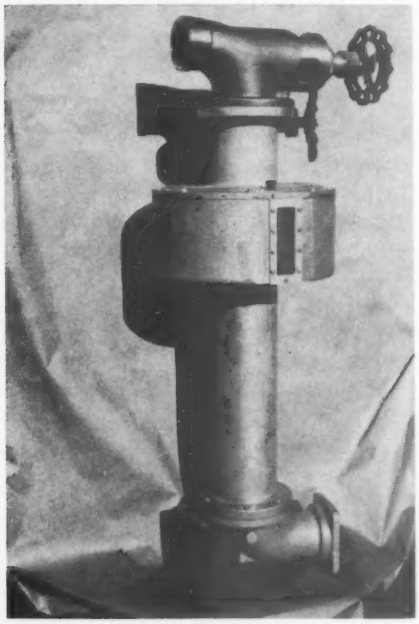
Purpose: To remove dust in grinding, buffing, polishing, milling, and cutting operations.

Features: Provides high collection efficiency, constant suction at hood, and no fire hazard. Tubes of new design perform final cleaning operation. Because there is no pressure build-up, dust is continuously removed from path of flow and discharges downward to a secondary receiver.



Collector is available in seven standard sizes ranging from 300 to 2100 cfm. Special assemblies extend the range.

Source: Aerotec Industries, Inc., Industrial Div., Dept. AE, Greenwich, Conn.



Air-Flow Measuring Device

Purpose: For any air or liquid flow measuring requirement.

Features: Designed for measuring flow of air conditioning process in electronic mechanism and fuel tank sections of missiles during pre-launching period. Is first airflow measuring device with direct "deadbeat" readings. Has revolving drum-type dial 25 in. in circumference permitting direct read-out of all flows from 20 to 200 cfm at any pressure from 2 to 12.5 psig. Can be constructed from nearly any metal, glass, fiberglass, or plastic.

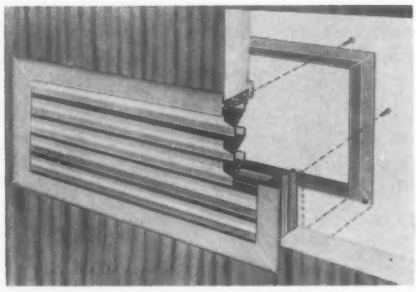
Source: Highland Engineering Co., Dept. AE, 1740 Berkeley St., Santa Monica, Calif.

Dial Thermometer for Ducts

Purpose: For duct and casing at air conditioning units, constant temperature rooms, and boiler stacks.

Features: Mercury actuated dial thermometers have uniform graduated scale for entire range, micro meter adjustable pointer, all stainless steel system, 10 to 12 in. bulb with union connection flange. Available in 4½, 6, and 8 in. dial sizes in a variety of ranges from -40F to 800F.

Source: Weksler Instrument Corp., Dept. AE, Freeport, N. Y.



C/S Door Louver

Purpose: For installation where cleanliness of facilities is of major importance, such as hospitals and sanitaria.

Features: Extruded aluminum unit can be removed and replaced quickly and easily to facilitate cleaning and disinfection. Sightproof, light-proof, and sound-proof models are available.

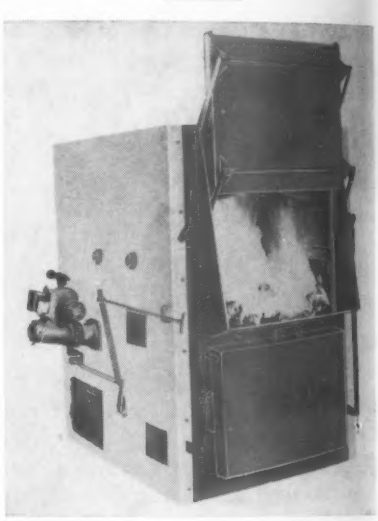
Source: Construction Specialties, Inc., Dept. AE, 55 Winans Ave., Cranford, N. J.

Remote Air-Cooled Air Conditioning System

Purpose: For large commercial or industrial installations. Extends Westinghouse line to 15 tons.

Features: Two new systems of 10 and 15 tons extend line to eight models from 2 to 15 ton sizes. Equipped with twin compressor systems, new sizes can be used separately with two 5 ton or 7½ ton fan and coil units to provide zone control. Built-in time delay relay permits step starting. Fan coil units are of modular design for flexibility of application.

Source: Westinghouse Air Conditioning Div., Dept. AE, P. O. Box 510, Staunton, Va.



Incinerator

Purpose: Will destroy 125 lbs. per hour of Type 1 waste containing 7 to 20 percent moisture.

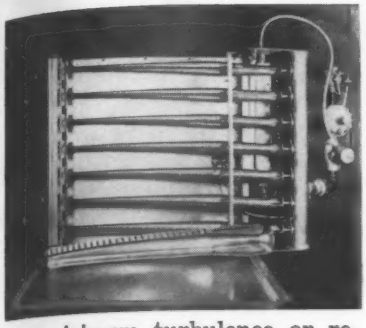
Features: CT destructor has dump and shaker lever for removal of fly ash without bending and shoveling. Has swing away charging door to keep hot face of door away from operator during charging. Measures 3 ft. 8 in. wide and needs only 4 ft. for cleaning and stoking.

Source: Morse Boulger, Inc., Dept. AE, 80 Fifth Ave., New York City 11.

Stainless Steel Gas Burner

Purpose: Increase burning efficiency of all types of gases ranging in heating values from 500 to 3,200 Btu/cu. ft.

Features: Used in Reznor DS series gas-fired duct furnaces. Has formed port burners with integral carryover. Straight line shape



offers minimum turbulence or restriction, gives high primary aeration coefficient. Slim profile and elongated port section allow high secondary air entrainment.

Source: Reznor Mfg. Co., Dept. AE, Mercer, Pa.

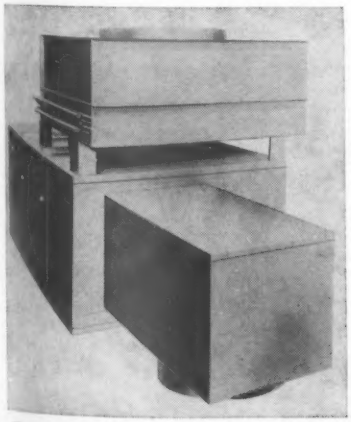
Combination Ventilator-Skylight

Purpose: Provides quantities of diffused natural light whether ventilator is open or closed.

Features: Called "Lite-'n-Aire Heat Valve," it is gravity type ventilator with Fiberglas components. Used with automatic operating equipment and egg-crate grilles.

Source: Swartwout Fabricators, Inc., Dept. AE, Kokomo, Ind.

Roof Mounted Cooling-Heating Unit



Purpose: Complete year-round system for commercial and industrial buildings, offering economies in installation, operation, and maintenance.

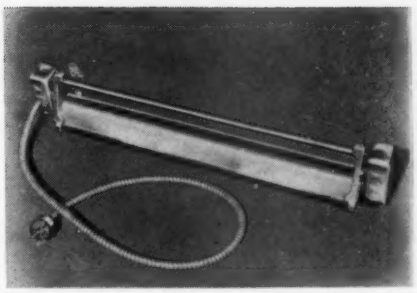
Features: Combines air-cooled 10-ton air conditioner with 240,000 Btuh gas-fired heating system. All internal piping and wiring done at factory. Air distribution plenum and diffuser supplied. Intake and discharge connections through end permit ductwork to diffuser. Unit measures 90 by 60 in. and 80 in. high. It weighs 2750 lbs.

Source: Typhoon Air Conditioning Div., Hupp Corp., Dept. AE, 505 Carroll St., Brooklyn 15, N. Y.

Radiant Heater Assembly

Purpose: Comfort heating in exposed locations, paint drying.

Features: Infra-red assemblies available in standards for 120, 240, and 440 volt use. Over-all lengths



from 24 to 84 in. Effective heating lengths from 18 to 78 in.

Source: Thermel, Inc., Dept. AE, 9400 Robinson Road, Franklin Park, Ill.

(Please turn to following page)

MASTER
Vent-All

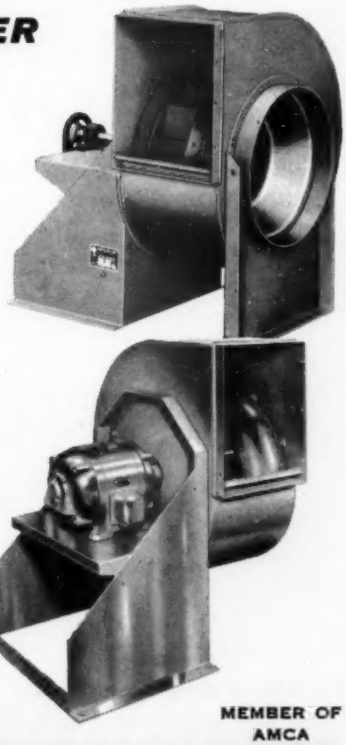
DOES IT BETTER...

IN ALL KINDS OF WEATHER

MASTER VENT SETS are brutes for punishment and take the elements in stride. They do a better job inside, too. Wherever there is an *air moving job,* be it an office building, industrial building, hospital, restaurant, laboratory, etc. it pays to use MASTER VENT SETS with all their built-in plus values.

- **Unbeatable for economy of operation and dependable year in and year out performance.**
- **Available with either forward or backward curve type impeller wheel, a drive to suit all requirements, and an arrangement for every need.**
- **Capacities from 250 CFM to 25,000 CFM.**

For the utmost in versatility a complete selection of optional equipment may be added to MASTER VENT SETS.



For complete information write for your FREE Master Vent Set Catalog No. 236

MASTER FAN CORP

MEMBER OF AMCA

1323 CHANNING STREET LOS ANGELES 21, CALIF. MAdison 2-1037

Serving Western Industry for over 40 years.

Unit Wet Dust Collector Reduces

SMALL PLANTS CAN HANDLE dust problems on a unit operations basis efficiently and profitably if they follow the example set by William M. Wilson's Sons, Inc., Lansdale, Pa.

William M. Wilson's Sons, Inc. manufactures a wide range of special purpose gasoline, kerosene, and oil pumps for truck operating firms, taxi cab fleets, farms, and industrial organizations.

These pumps are used to deliver and record liquid fuels in the same manner as conventional gasoline pumps found at filling stations – except no provisions are made for recording price.

Castings used in the manufacture of these pumps are purchased, then machined and finished by Wilson prior to assembly. Fine particles of cast iron and aluminum from two belt sanders and a vertical wheel grinder had been exhausted to the open air outside the plant.

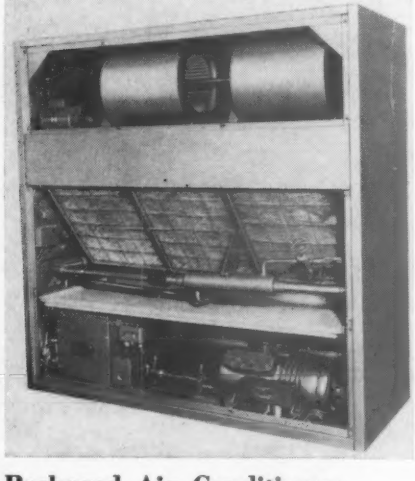
As a result, the minute metal particles created a messy problem just outside the plant, causing high plant housekeeping costs. It was also necessary for belt sander and grinding wheel operators to wear protective dust masks.

By installing a small, self-contained wet dust collector, William M. Wilson's has eliminated an expensive maintenance problem and raised employee morale

Exhaust hoods on grinder and sander (below) direct fine particles of cast iron and aluminum from castings used in Gasboy pumps to the wet collector (right) which is installed outside the plant. Photos courtesy Panborn Corp.

New PRODUCTS

(Continued from preceding page)



Packaged Air Conditioner

Purpose: For use in restaurants, stores, factories or wherever high capacity self-contained air conditioners are required.

Features: PAC units available in 10, 15, 20, 25, and 30 hp. capacities. Compact, quiet in operation, the units are adaptable in the field for connection to ductwork. Three largest sizes are equipped with dual compressors. Smaller two are available with free air discharge plenum and may be had with steam coils in plenum.

Source: Dunham-Bush, Inc., Dept. AE, 179 South St., West Hartford, Conn.

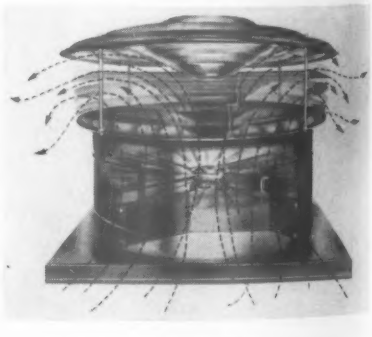
Power Roof Exhauster

Purpose: Exhaust air automatically and provide weather tight seal when not in use.

Features: Spun-aluminum, cone shaped Divertco-Damper is lifted by column of discharged air and seated against Weather-Dome cover, diverting flow of air radially to discharge all around circumference of unit.

Weather-Dome support and damper guide rods are neoprene coated.

Source: Geni-Air, Inc., Dept. AE, P. O. Box 39691, Los Angeles 39, Calif.



Use Communications Center, page 35, for requesting more information about articles, advertised products, literature, and for comments about any of the editorial material in this issue of AIR ENGINEERING.

Maintenance at Small Plant

by providing clean, dust-free, in-plant air and eliminated the necessity of machine operators wearing face dust masks.

Dust laden air is exhausted through machine hoods on the grinder and sander at 2000 cfm into the wet collector. The dust laden air is drawn through collector tubes where it is mixed with small particles of water.

The mixture of air and dust laden drops of water expel at high velocity from the outlet of the tubes against impingement surfaces. Sludge deposited on the impingement surfaces is washed down into the tank and settles to the bottom for periodic removal.

Drops of water not removed from the air at the impingement plate are deposited on baffles in the water eliminator section and drains back into the tank. Clean air is drawn through the collector outlet for discharge. ▲▲

CREDITS

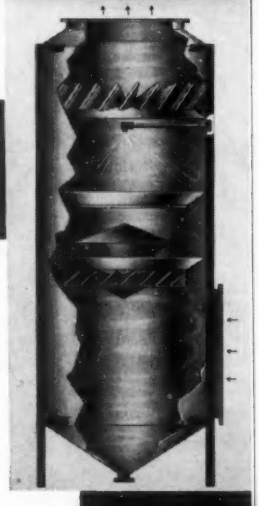
Ventrijet wet collector: *Pangborn Corporation.*

FOR 99 PLUS % EFFICIENT CORROSIVE FUME REMOVAL and MAINTENANCE FREE OPERATION

CARPART (TYPE CF) FUME SCRUBBERS

500 cfm to 40,000 cfm Capacities

efficiencies on:
- CHROMIC ACID 99.4% to 99.8%
- SULFURIC ACID 99.4% to 99.5%
- BRIGHT DIP MIX 99.8% to 99.9%



Fabricated Entirely of Boltaron unplasticized PVC

- LOWER INITIAL COSTS!
- LOWER ERECTION COSTS!
- NO MAINTENANCE COSTS!

Effectiveness due to combination of 4 stage water curtain with baffled impingement and continuous centrafugal heavy particle separation.

For *Engineering and Application Data on Boltaron PVC Fume Scrubbers and Plastic Exhaust Systems, contact . . .*

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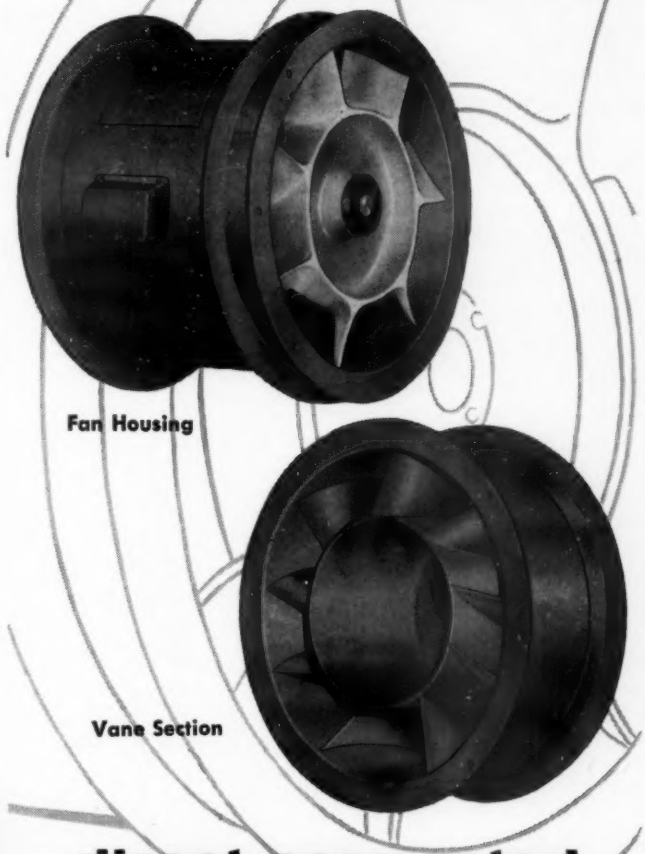
CARPART CORPORATION Mfg Div. OWOSSO, MICHIGAN

another outstanding design development from

Aerovent



direct-connected vaneaxial fans

with removable vane sections

Engineered for high-pressure, high-velocity air distribution systems, these units feature a unique removable vane section which simplifies installation and permits easy access for routine cleaning and maintenance.

Available in 30 models in sizes 18" to 48" for capacities from 3230 to 67,300 cfm with special design features for all application requirements.

Write for Bulletin 475

Air deliveries of all Aerovent equipment are tested and rated in accordance with established and accepted codes and each unit is guaranteed by the manufacturer to deliver its rated performance.

CERTIFIED PERFORMANCE

Aerovent

Aerovent FAN COMPANY, INC.

ASH AND BRIAN STREETS PIQUA, OHIO

Idlewild - -

(Continued from page 29)

the architectural aspects of the building.

Unit heaters serve the operation areas, vestibules, service areas and utility rooms.

As in the other terminals, HTHW and chilled water is introduced into the building through a basic machine room. The basic secondary fluids are generated in heat exchangers and controlled as described previously. Utility rooms for the equipment are provided as needed for efficient distribution.

Port Authority Operations Building

This building is an existing one occupied by the manager of the airport and his staff. There are also several tenant areas that are occupied by operating personnel of companies serving the airlines.

The original building had two boiler rooms that supplied steam, generated by a total of three boilers, to direct wall radiation that supplied the major heat to occupied spaces. Unit heaters in large areas were also supplied with steam. Condensate was returned to the boiler room by gravity and condensate pumps.

In 1957-1958 two steam generators were installed in one of the boiler rooms and the boilers were abandoned. With some minor adjustments to the piping system, all the steam could be furnished from the single source. HTHW from the central plant furnishes primary heat to steam generators.

A chilled water supply from the central plant was brought into the building to cool all of the main offices and certain of the working areas. It was decided to only cool some offices for the present and 16 air handling units were installed in the ceiling of the offices concerned.

These are essentially unit coolers, equipped with a chilled water coil, permanent type cleanable filters, with a minimum discharge duct and double deflection grille and return register. Unit air capacity is 640 cfm while absorbing a total heat of 19,800 Btuh. A wall thermostat in each room controls a two position motor operated valve on the chilled water.

A central fresh air fan, with 1975 cfm capacity furnishes outside air for ventilation to each unit. It has been sized for ultimate delivery and is presently running at reduced output.

It is planned to increase the conditioned space in the future.

Basically, the operation for heating and cooling is similar in all the buildings with the few exceptional items peculiar to an individual design. In four of the unit terminals, chilled water booster pumps were installed to overcome the system resistance designed into each building. Controls were installed to assure the maximum pressures generated by the booster pumps were sufficient to overcome system resistance but would not impose pressures on the main transmission lines.

In general, mechanical installations are well designed and installed and shoud add greatly to the comfort of the passengers using the facilities. ▲▲

CREDITS

International Arrivals and Wing Buildings

Architect: *Skidmore, Owings and Merrill.*

Engineers: *The Port of New York Authority.*

General Contractor: *Caldwell, Wingate & Co.*

Central Heating and Refrigeration Plant

Architect: *Skidmore, Owings and Merrill.*

Mech. Engineers: *Seelye, Stevenson, Value and Knecht.*

General Contractor: *The Foundation Company.*

Pan American Airlines Terminal

Architect; Engineers: *Tippetts, Abbett, McCarthy & Stralton.*

General Contractor: *Turner Construction.*

Trans World Airlines Terminal

Architect: *Eero Saarinen and Associates.*

Mech. Engineer: *Jaros, Baum and Bolles.*

General Contractor: *Grove, Shephard, Wilson and Kruge, Inc.*

United Airlines Terminal

Architect: *Skidmore, Owings and Merrill.*

Mech. Engineers: *Syska and Hennessey.*

General Contractor: *Humphrey's and Harding.*

American Airlines Terminals

Architect: *Kahn and Jacobs.*

Mech. Engineers: *Jaros, Baum and Bolles.*

General Contractor: *Turner Construction Company.*

Eastern Airlines Terminal

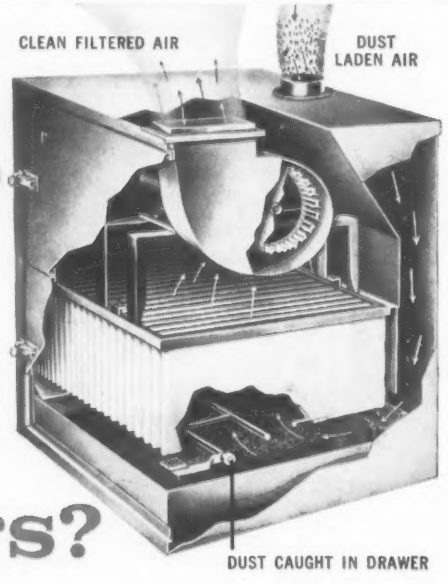
Architect: *Chester L. Churchill.*

Mech. Engineers: *Seelye, Stevenson, Value and Knecht.*

General Contractor: *Gilbane Building Company.*

have you got the facts on money-saving preventive maintenance with

Torit dust collectors?



Clean machines hold close tolerances *better* and *up to 80% longer*. Result: a measurable saving in both the cost and frequency of servicing and maintenance work. You can protect your client's plant and equipment investment, help reduce potential production breakdowns, by specifying TORIT Dust Collectors. In the cabinet type (illustrated by cutaway drawing) filters are rated 99.99% efficient by weight on particles as small as ½ micron! Compact Torit high efficiency cyclone and cabinet type units are designed to save space, install anywhere. Your Torit representative will gladly give you dust collector specifications, performance charts, dimensional drawings and installation suggestions. Write:

TORIT MANUFACTURING CO.
1133 Rankin Street • St. Paul 16, Minn. • Dept. 1917

New Literature

Radiological Health Data

"Radiological Health Data," a new monthly technical publication, gives levels of radioactivity in the environment. Data on radiation levels in air, water, and milk comprise the bulk of the first issue.

Publication is prepared by the Public Health Service under a delegation by the Secretary of Health, Education, and Welfare and may be purchased from the Office of Technical Services, Department of Commerce at 50 cents per issue or $3 for a 6-months subscription.

Source: *Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.*

Duskolector Catalog

Practical, effective ways for solving dust, dirt, and mist collecting problems in the plant are described in a new 16-page catalog.

Text contains detailed explanations of how to achieve maximum results with various models in the line of Hammond DusKolectors, as well as general application information.

In addition to photographs, cutaway diagrams and floor plans, the Catalog DK-820 gives features, dimensions, and specifications on each of the models, accessories, and extra equipment.

Source: *Hammond Machinery Builders, Inc., Dept. AE, 1600 Douglas Ave., Kalamazoo, Mich.*

Ultra Clean Facility Brochure

Three color, 8-page brochure entitled "Requirements for an Ultra Clean Facility" has index tabs for quick reference. Main subject headings are: Construction and Environmental Control Systems.

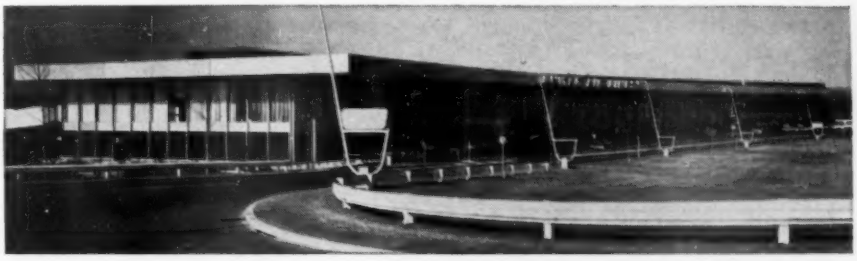
Sub-division discusses: Modular Wall Panels, Non-Dusting Materials, Illumination, Floor Covers, Air-Showers, Pass Through Chambers, Pressurized Cabinets, Temperature-Humidity, Air Pressure, Air Replacement, Filtration, etc.

A perforated application information form is attached which enables each potential user to get engineering information for Shielding on his particular application.

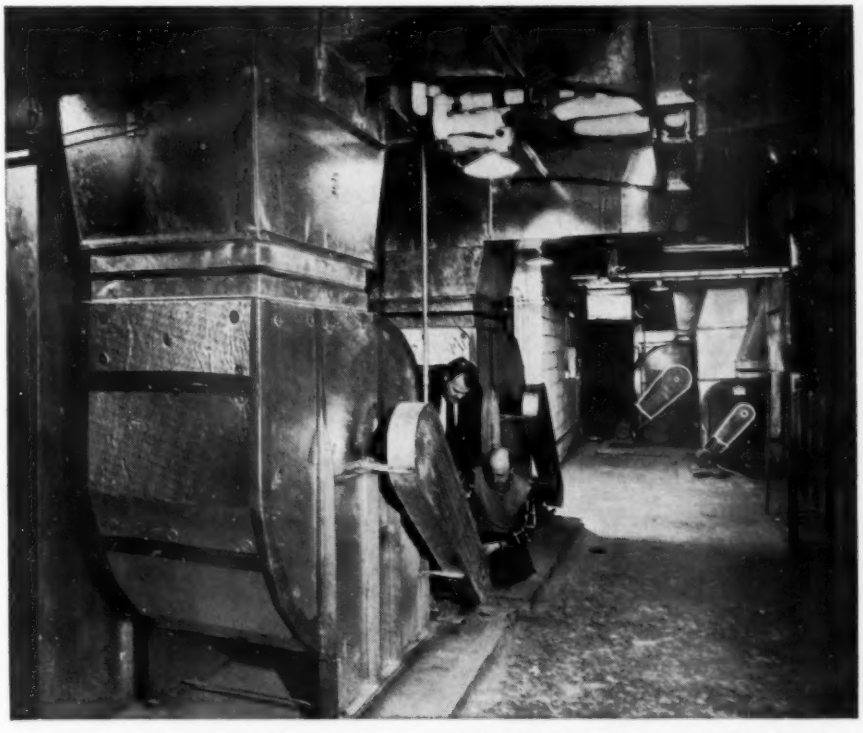
Source: *Shielding, Inc., Dept. AE, 514A, N. Read Ave., Riverton, N. J.*

(Please turn to page 51)

ANOTHER PEERLESS ELECTRIC SPECIAL BLOWER APPLICATION



United Air Lines Terminal Building, Idlewild Airport. Architects: Skidmore, Owings & Merrill. Consulting Engineers: Syska & Hennessy, Inc. General Contractors: Humphreys & Harding. Mechanical Contractors: A. D. Walker & Co., Inc.



Four of the 52 Peerless Electric Blowers. Shown are Philip M. Larkin (left), Senior Project Engineer, and Warren Dorrman (right), Project Supt. of A. D. Walker & Co., Inc.

"COMPLEX AIR HANDLING PROBLEMS MET BY PEERLESS ELECTRIC BLOWERS"

—*Philip M. Larkin, Senior Project Engineer*

Excessive heat transmission from an 800′ long, 20′ high glass front makes difficult the design target of 78° F maximum summer temperature with 50% relative humidity. In winter the need is for 65-70° F with humidity low enough to avoid condensation. Variations cannot exceed a minus 2% in temperature or plus 5% humidity. And the complete system must serve 45 different areas of the building, including the kitchen.

Tight space conditions and aircraft fumes added to the installation problem. The solution: 52 Peerless Electric Fans to supply and exhaust the 175,000 square foot building area. Peerless Engineers worked closely to make possible the necessarily delicate air balance.

No matter how complex your next job, let Peerless Electric engineer your air moving needs. Write: *Peerless Electric Division, H. K. Porter* Company, Inc., W. Market Street, Warren, Ohio.

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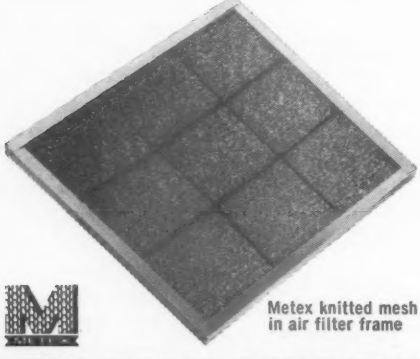
Cutting knitted mesh for air filter



Metex knitted mesh in air filter frame

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A DIVISION OF GENERAL CABLE CORPORATION

Chemical Industry

(Continued from page 34)

tive equipment are often used as a method of control, but this method is often unsatisfactory. The contaminant is present in the workroom atmosphere and improper use of protective devices may result in a serious problem. In addition, it is not always possible to effect the desired control, especially when materials to be controlled are irritating or may be absorbed through skin contact.

A more desirable method of control is the use of hood enclosure and mechanical exhaust ventilation to prevent or limit the escape of the gases, dusts, vapors and mists to the workroom. To accomplish this, the ventilation is applied at or as close to the source as is feasible.

We will review some of the operations performed in chemical manufacture in future issues of AIR ENGINEERING. The potential exposures to employees that may occur will be discussed and the design of hood and mechanical exhaust systems that have been used successfully for control of these potential exposures will be outlined. In cases where there are several methods which may be used for control, these will be reviewed and the advantages or disadvantages of each method discussed.

It is realized that chemical equipment design varies considerably from manufacturer to manufacturer and therefore details of hood design will also vary. It is believed, however, that satisfactory control can be realized for most equipment by utilizing in general the hood designs discussed.

No attempt will be made to describe methods for computing static pressures, and designing ventilation ductwork as they are covered adequately elsewhere.

Next month we will start this series with the problem of controlling irritating or toxic dusts liberated in the process of packaging solid materials into drums or barrels. ▲▲

Pollution Factor In Con Ed Case

U.S. Supreme Court has agreed to review a Federal Power Commission ruling denying Consolidated Edison Co., New York City, a direct pipeline supplying natural gas from Texas to its generating plant on New York City's East River.

F.P.C. said that the proposed selling price of 19¼ cents per cu. ft. would drive up the price of natural gas in the area.

Con Ed maintains that the use of natural gas would not drive up gas prices and that such use would help reduce air pollution. New York City also filed a brief emphasizing need for natural gas to reduce air pollution from the plant, which is near the United Nations headquarters. City said burning of coal in the plant produced soot more than 20 tons a square mile heavier than the N.Y.C. average.

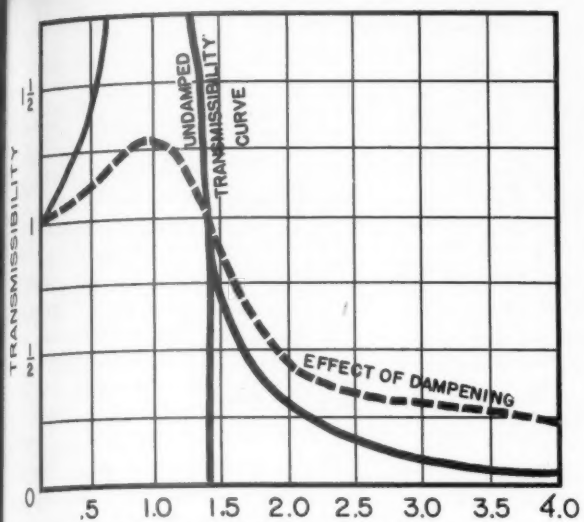

Fig. 8: Transmissibility for various ratios of forcing frequency to undamped natural frequency.

Noise & Vibration

(Continued from page 26)

suitable for a majority of applications. This formula is plotted in Fig. 7 showing natural frequency vs. static deflection.

Fig. 8 shows the transmissibility for various ratios of forcing frequency to undamped natural frequency. The effect of damping is shown by the dotted line. Actually most isolators have some degree of damping which decreases the transmissibility at resonance and increases the transmissibility in the isolating range. Note that the ratio of forcing frequency to natural frequency must be greater than $\sqrt{2}$ in order to obtain isolation of any amount.

There is a practical limit to the reduction of transmissibility. A very large static deflection of the isolators may lead to instability in the lateral direction. Also, as in the case of rubber, a continuous overstrain will lead to creep and reduction of the isolator life. ▲▲

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MANUFACTURERS AND ENGINEERS — SAND BLAST AND DUST COLLECTING EQUIPMENT — WELDING FUME COLLECTORS

New Appointments

Robert T. Pring has been appointed to the newly created post of manager, dust collector sales at Dracco Div. of Fuller Co., manufacturer of dust control and pneumatic conveying systems.

Pring

Prior to joining Dracco, Pring had spent 10 years as technical director of a major dust collector manufacturer. Previously, he had been director of the industrial hygiene department of Kennecott Copper Corp.

S. R. Hill has been appointed as a senior staff engineer in the commercial-industrial section of the Westinghouse air conditioning division at Staunton, Va. In his new position, Hill will be responsible for marketing of commercial packaged cooling equipment up to 30 tons.

During 1958 and 1959, Hill was a partner in a consulting engineering firm in Oklahoma City.

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Richard G. Whitlock has been promoted to assistant sales manager of The W. W. Sly Mfg. Co., Cleveland. Previously, he was engineering service manager for the Cleveland manufacturer of dust control systems, industrial ovens, blast-cleaning equipment and tumbling mills.

Whitlock

Whitlock formerly was with Babcock & Wilcox Co.

Sylvan L. Hanauer has been appointed consulting engineer to Morse Boulger, Inc. of New York City. In addition he will supervise the company's new research and development program including a new design of automatic double flue incinerator. Hanauer, until last year, was deputy commissioner of New York City's department of air pollution control.

Hanauer

A divisional manager and two territorial managers were appointed by Western Precipitation Div. of Joy Mfg. Co.:

Leonard F. Lang was promoted to manager of power industry engineering sales. Based in Chicago, he has charge of all company operations dealing with power generating companies. He was previously manager of the midwest territory.

Eugene F. Scherr succeeds Lang as manager of the midwest territory where he has served for 15 years.

Howard W. Lange manages the western territory from San Francisco where he has served for many years.

Henry Sleik, for many years a prominent figure in the air conditioning industry, has retired from active participation in Connor Engineering Corp.

With Connor for 41 years, many of them as a director, vice president, senior application engineer, and supervisor of foreign operations, Sleik will continue to serve Connor as a technical consultant.

Dr. Seymour Calvert, associate professor of chemical engineering at Case Institute of Technology, has been appointed chairman of the newly formed Air Pollution Advisory Board for the city of Cleveland.

Calvert

The Board will review and aid in the development of the program of the Cleveland Division of Air Pollution Control, develop and coordinate research programs, provide liaison with other organizations and recommend necessary legislative action.

American Standard Industrial Div. has announced the appointments of:

Graeme B. Supple as product manager in charge of future planning and development for products on the air side of air conditioning product lines.

Supple

J. A. McCain replaces Supple as manager of the Great Lakes sales region.

R. W. Dallas, formerly manager of the Buffalo office, succeeds McCain as head of the Detroit sales office.

R. L. Graham, former manager of the Moline office, was named manager of the Los Angeles office.

John B. Koch as director of engineering for the Kewanee, Ill. plant.

Sidney S. Emison has been named vice president of Continental Air Filters, Inc. He has been connected with Continental, except for an interval of a few months, since October, 1948.

Emison

Emison is a charter member of Louisville chapter of American Society of Heating, Refrigeration, and Air Conditioning Engineers.

Dr. E. M. Adams of Dow Chemical Co. has been elected chairman of the Manufacturing Chemists' Association's air pollution abatement committee.

New Literature

(Continued from page 47)

Investment Booklet on Industrial Air Conditioning

How to determine whether factory air conditioning will be a profitable investment is the subject of a new booklet entitled "Will Factory Air Conditioning Pay Off For Me?"

Booklet presents four key check-figures with which plant executives can qualify their operation. Two or more affirmative answers indicate that air conditioning would not only pay for itself but would return a profit on the investment.

Source: *Carrier Corp., Dept. AE, Syracuse, N. Y.*

Health of People Who Work

Handbook for industrial health physicians and nurses is edited by Albert Q. Maisel from contributions from more than 200 authorities.

Data taken from discussions of the 1959 National Health Forum sponsored by the National Health Council. Copies priced at $4.50 postpaid.

Source: *National Health Council, Inc., Dept. AE, 1790 Broadway, New York 19, N. Y.*

Part IV of "What You Should Know About Respirators" was squeezed out of this issue due to space limitations. It will appear in the July issue.

Atmospheric Diffusion and Air Pollution

Volume contains proceedings of a symposium held at Oxford, England, Aug. 24-29, 1958 under the auspices of the International Union of Theoretical and Applied Mechanics and the International Union of Geodesy and Geophysics.

Edited by F. N. Frenkiel of Johns Hopkins University and P. A. Sheppard of the University of London, it is priced at $12.

Source: *Academic Press, Dept. AE, 111 Fifth Ave., New York City 3.*

Leaflet on Humidity Control Unit

Leaflet SCD 331.01 describes new SCD sprayed coil humidity control units introduced earlier this year by Drayer-Hanson.

Three-color leaflet presents full specifications data, cutaway photo, and dimensional drawings.

Source: *Drayer-Hanson Div., Crane Co., Dept. AE, 3301 Medford St., Los Angeles 63.*

Fan Installation

(Continued from page 33)

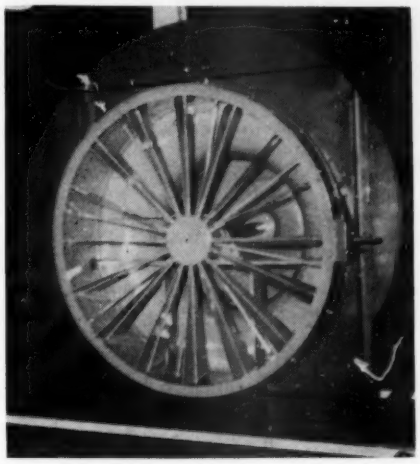

Fig. 23: *The inlet damper operates by imposing a spin on the fan inlet. Because it is relatively more complicated and costly than either type of outlet damper, it is never used in material handling systems. Because of the adverse effect of dirt in the mechanism, control linkage is placed outside the airstream. Chief advantage of the inlet damper is its ability to allow lower power consumption at reduced capacities, making for considerable savings in some process work and in year-round air conditioning systems.*

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Correction

In a table on page 43 of the May issue of AIR ENGINEERING showing results obtained with several high efficiency filter media tested with a laboratory generated droplet nuclei aerosol and with naturally occurring dust-borne bacteria, a glass asbestos paper filter was erroneously identified as H93B. It should have been H98B, that is used in Cambridge Filter Corp.'s Micretain series filters.

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Cover photo shows "White Room" operation at Massachusetts Institute of Technology instrument lab. For complete story on "White Room" enclosure design, see article on page 42.

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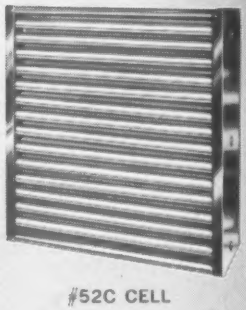

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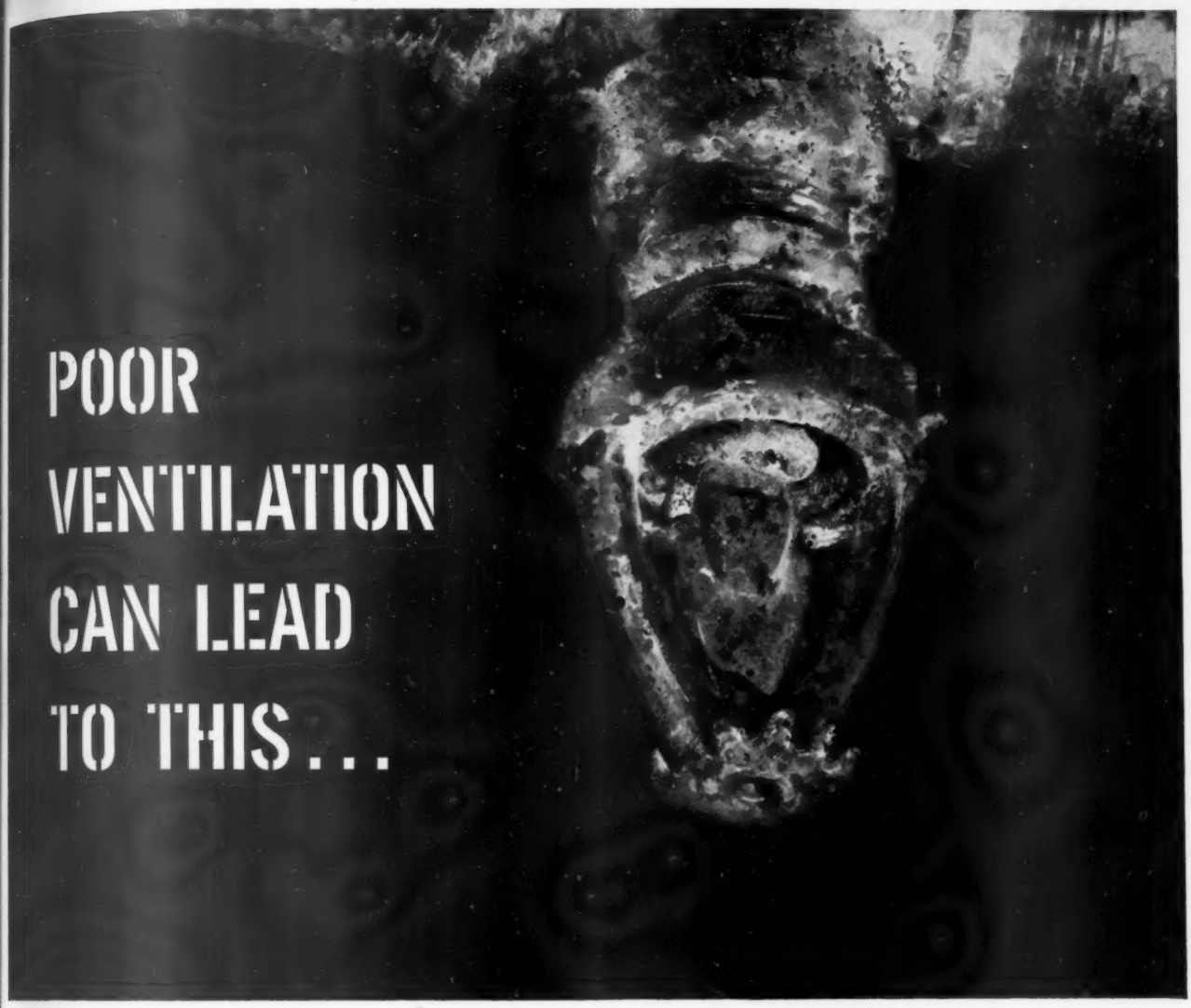

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✓CONTROLS FOR MAKE-UP AIR

How to control make-up air units such as roof ventilators, coils, unit heaters, burners, blowers, etc. Just in time to help you get ready for the heating season.

✓FAN LAWS MADE EASY

Principles of fan selection for air conditioning, ventilating or exhaust systems. Lots of charts, graphs, tables, photos to help you. This is an article you'll want to clip out and save.

✓BERYLLIUM DUST CONTROL PRINCIPLES

Part II of this series takes up local exhaust ventilation, hood design, for manual, batch and unattended operations of many kinds.

✓VENTILATION IN THE CHEMICAL PROCESS INDUSTRIES

How to design ventilation systems for reactor vessels, including tanks, tubs and kettles, under all degrees of temperature and pressure.

✓WHAT YOU SHOULD KNOW ABOUT INDUSTRIAL RESPIRATORS

Use of self-contained respirators, precautions in use of all types of respirators, their limitations, abuse and proper care.

Use Communications Center, page 37, for requesting more information about articles, advertised products, literature, and for comments about any of the editorial material in this issue of AIR ENGINEERING.

If you wish to contact manufacturers directly, street addresses are given. But please mention you saw it in AIR ENGINEERING.